AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

MAY 15, 1959

DESIGN ENGINEERING SHOW NUMBER

Features • • •

Special Techniques at Ford's Sharonville Plant
New Records Expected at Indianapolis "500"
Preview of the 1959 Design Engineering Show
American Equipment in British Vauxhall Plant
Strong, Light Weight Design of the Mighty-Mite
Standard Motor Co. Unveils Triumph Herald Model

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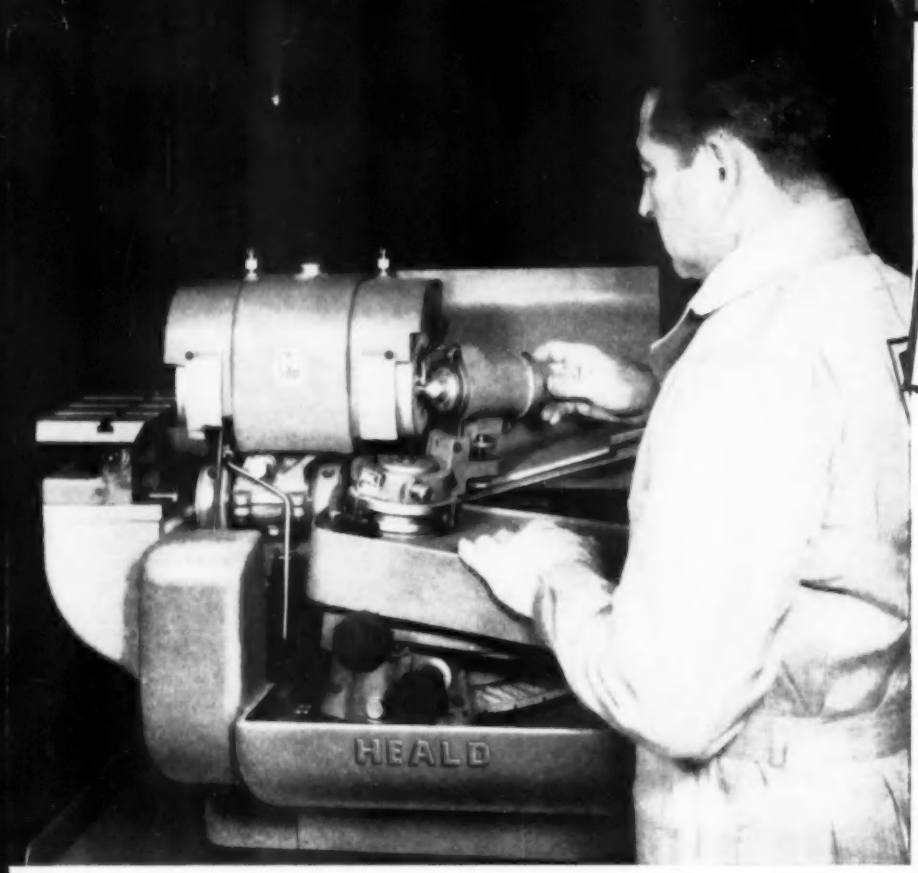
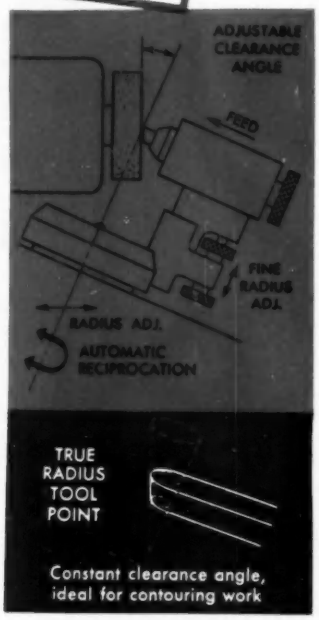
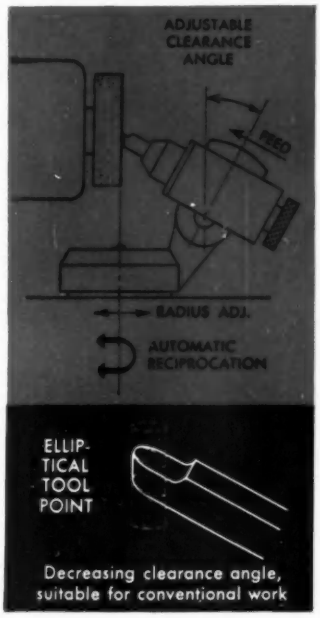
Automotive and Aviation Manufacturing
ENGINEERING • PRODUCTION • MANAGEMENT



Another **NEW** PRODUCT by Heald

☐ File for Reference
☑ Send for Bulletin





New Model 4 TOOL SHARPENING MACHINE

provides highest precision and economy for both **TRUE RADIUS** and **ELLIPTICAL POINT** tool grinding

SETTING new standards of accuracy and economy, the new Heald Model 4 Tool Sharpening Machine is available for both *true-radius* and conventional *elliptical-point* tool grinding. The True Radius arrangement provides a constant tip radius and constant clearance angle, permitting greater accuracy where the point of contact with the tool varies with the configuration of the workpiece, as in contoured shapes. Where such tool geometry is of no advantage, the Model 3 Tool Sharpening Machine, capable of grinding elliptical point tools only, offers desirable savings in initial cost.

With either model, you get *fully automatic tool reciprocation* providing uniform and repetitive tool tip accuracy which permits one operator to tend several machines at the *same time*. An occasional adjustment of the feed knob (as in photo above) is the only operator attention needed. Offhand grinding attachment at left end of machine is standard equipment, furnished at no extra cost.

Remember — in metal cutting, it's the precision of the *tool tip* that guarantees precision results. Ask your Heald representative for complete information on this new Model 4 Tool Sharpening Machine, or send for Bulletin 2-4-3, Issue 1.

It PAYS to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Circle 101 on Inquiry Card, for more data

KNOW YOUR ALLOY STEELS . . .
This is the first of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

What is an Alloy Steel?

Here is an easy definition to remember: An alloy steel is a grade of steel in which one or more alloying elements have been blended to give it special properties that cannot be obtained in carbon steel.

Or, here is the metallurgical definition: An alloy steel is one in which the maximum specified content of alloying elements exceeds one or more of the following limits—

Manganese, 1.65 pct; Silicon, 0.60 pct; Copper 0.60 pct

or in which a definite range or a definite minimum quantity of any of the following elements is specified or required within the limits of the recognized commercial field of alloy steels: aluminum, boron, chromium up to 3.99 pct, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, or any other element added to obtain a desired alloying effect.

As a rule, alloy steel is more difficult to make than carbon steel. There are more elements to be kept within specified ranges and, in general, the ranges of the alloying elements are comparatively narrow; hence the mathematical chances for producing off-heats are correspondingly increased. Moreover, most alloy steels require special reheating and cooling to prevent such imperfections as flaking and cracking.

Surface imperfections must be removed from the billets by scarfing, chipping, or grinding. More exacting methods of testing and inspection are necessary to insure uniformity.

Where Does It Pay To Use Alloy Steel?

Generally speaking, it is advisable to use alloy steel when more strength, ductility, and toughness are required than can be obtained in carbon steel in the section under consideration. Alloy grades should also be used where specific properties such as corrosion-resistance, heat-resistance, and special low-temperature impact values are needed.

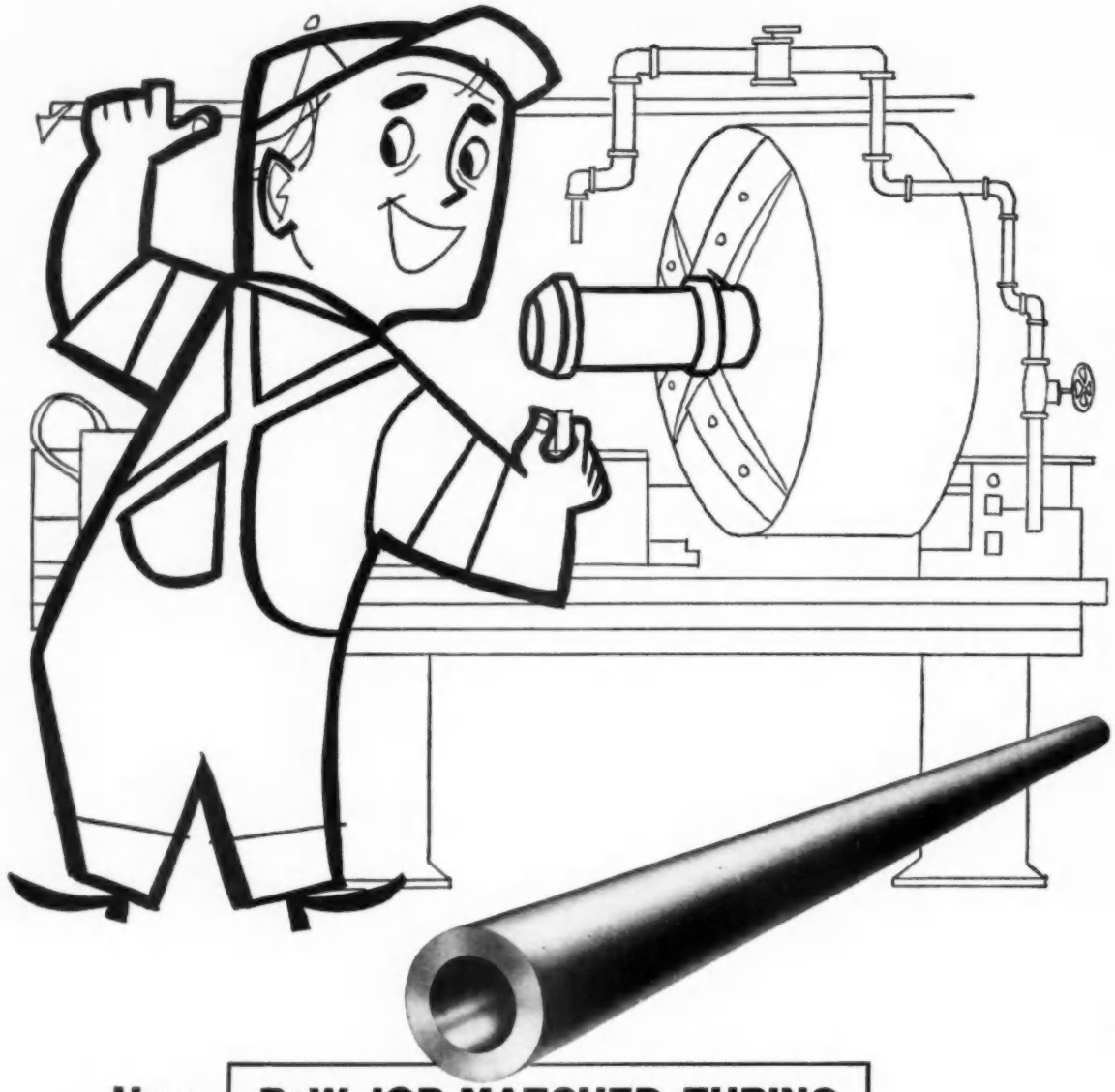
In some cases it requires considerable study to determine when and how to use a particular alloy steel to advantage in a product. Where there is any problem or doubt concerning its use, Bethlehem metallurgists will gladly give impartial advice on analysis, heat-treatment, machinability, and expected results.

In addition to manufacturing all AISI standard alloy steels, this company produces other than standard analysis steels and the full range of carbon grades.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Circle 104 on Inquiry Card for more data



How B&W JOB-MATCHED TUBING speeds machining of precision parts

. . . Uniform close tolerances—require minimum machining to "clean-up."

. . . Controlled metallurgical structures—provide optimum machinability.

. . . Complete size range—permits choice of a tube size most appropriate for end use.

These are just a few reasons why it pays to specify B&W Job-Matched Seamless Mechanical Tubing for production of hollow precision parts. Call your local B&W District Sales Office, or write for Bulletin TB-340 for full information. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

B&W

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

TA-9007-SM2

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

Circle 105 on Inquiry Card, for more data

MAY 15, 1959 VOL. 120 No. 10

Ford Handling System Speeds Production

An integrated materials handling system, together with automatic feeding, loading, and unloading devices, is speeding production of small parts for Ford's automatic transmission. Page 54.

Powder Metal Show

Speakers at the 15th annual meeting of MPI stressed new fabricating techniques as well as the growing number of applications for powder metal parts. Page 58.

New Body Design for Mighty-Mite

Twin Coach Co. solved the problem of building a tough, lightweight body for Mighty-Mite by using new embossing applications and box sections, and by simplifying the design. Page 59.

Indianapolis Race Preview

Many records are expected to fall as cars are tuned up for the 43rd running of the Indianapolis speed classic. Here is an expert, on-the-spot roundup of the major entries. Page 60.

Advances in Static Controls

More automotive plants are going in for static controls to step up their automation programs. Recent developments in this field were aired at Westinghouse Electric's annual machine tool forum. Page 64.

ASTE Annual Meeting

New ideas on cost control dominated the proceedings of the ASTE's annual meeting in Milwaukee. Page 68.

British Firm Unveils New Car

The new Triumph Herald breaks with British small-car tradition by using a separate chassis frame with all-independent suspension. Page 69.

Vauxhall Uses Latest American Machines

General Motors has installed over 1000 new machine tools, mostly American, in its Vauxhall plant in Britain. This is part of a $100 million program to step up production of engines, transmissions, and axles. Page 70.

Earthmoving Industry Conference

Users of construction equipment got a chance at the Earthmoving Industry Conference to tell manufacturers what kind of machines they would like to see in the future. Page 73.

Meeting of Lead and Zinc Industries

Automotive uses of lead and zinc came in for a large share of attention at the joint meeting of the Lead Industries Association and American Zinc Institute. Page 73.

Design Engineering Show Preview

Some 12,000 products, ranging from metal alloys, plastics, and electronic components to fasteners and finishes, will be displayed at the 1959 Design Engineering Show. Page 74.

76 New Product Items And Other Features, Such As

News of machinery industries, airbriefs, government contract awards, and industry statistics. . . . *continued on next page*

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MEMBER

NBP National Business Publications, Inc.

SBME Society of Business Magazine Editors

ABC Audit Bureau of Circulations

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

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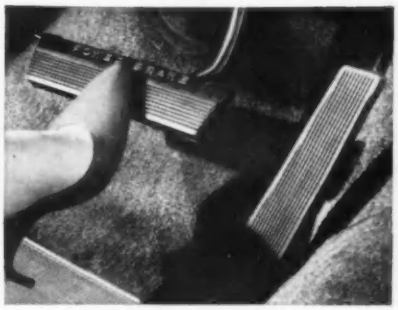
This is BENDIX PRODUCTS DIVISION . . .

"CREATOR OF SUCCESSFUL NEW SALES FEATURES"

New power to steer! Today's driver has greatly augmented ease of handling, control and assurance—thanks to Bendix* power steering. It has increased in popularity every year since its introduction, and today most new car buyers demand it.



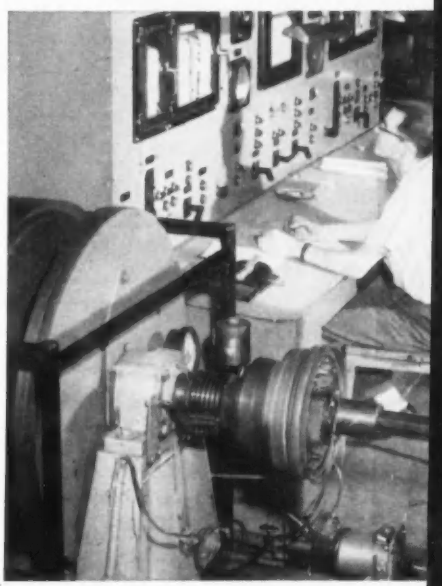
New power to stop! Safety is multiplied many times for the driver of today's faster, more powerful automobile . . . by Bendix*-pioneered power brakes. Millions of car buyers each year "buy" this new and better concept in safety and better control.

Now—brakes that adjust themselves! This latest Bendix braking development adds the powerful sales appeal of economy to the tried-and-true one of safety. More cars every year have this new feature—it's only a matter of time until they all do.

Helping make each model year as dramatic as a year-long "Opening Night", the automakers are seconded by suppliers like Bendix Products Division. While master carmakers and designers are concerning themselves with problems of total design and concept, specialists like Bendix Products Division, working in specialized areas such as steering and braking, create innovations and improvements that take their place in the total design yet, in their own right, are powerful interest creating salesmakers.

Three of the sales successes developed by Bendix Products Division are shown at the top of the page. These and many others are being demonstrated on the road every day by practically every car on the road—and by millions of new cars sold every year.

In developing features like these, Bendix Products Division benefits from the planning talents, the research skills, and the production know-how of its own engineering staff first . . . but also from the unique Research Division and the 24 divisions of the Bendix Aviation Corporation. Through the products of Bendix Products Division, these talents are available to you, too. Why not put them to work for you?



Testing Torque and Temperature! Research engineer checks various operating factors such as torque and temperature on a new brake design undergoing dynamometer test in Bendix Engineering laboratory.

Planning Committee in Session! Almost endlessly they debate two key questions: "Will it work?" and "Will it sell?" Here's just one of the thousand of technical and strategy meetings at all levels that precede the launching of a new Bendix product.

*REG. U. S. PAT. OFF.

Bendix PRODUCTS DIVISION
South Bend, IND.

Bendix
AVIATION CORPORATION

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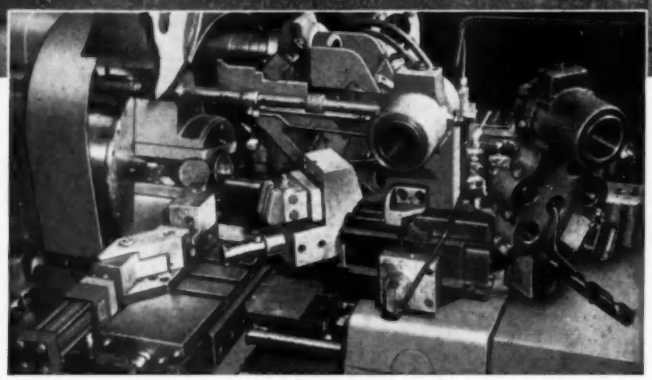

Edward Valves Div. cuts setup time on valve bodies

Takes advantage of electric setup control panel, octagonal turret, JETracer on Gisholt Fastermatic

You may spot production ideas in the way Edward Valves Division of Rockwell Manufacturing Company, East Chicago, Indiana, is increasing production of 1½" steel Univalve bodies.

A new Gisholt MASTERLINE 2F Fastermatic Automatic Turret Lathe is doing the job. With the Fastermatic's electric setup control panel, the operator preselects all important machine functions—including low spindle speeds for forming and threading, and high speeds for other operations. And with the Gisholt JETracer slide tool mounted on an 8-sided turret, a maximum number of surfaces are machined in a single chucking—with greater accuracy, finer finish and with more consistent quality.

Parts are held in an 18" 2-jaw hydraulically operated chuck. Automatic positioning at the end of each cycle speeds loading and unloading. Once the automatic cycle starts, turret tools drill, turn, face, form, relieve, chamfer, bore and thread. Cross slide tools face and chamfer. Critical internal diameters are finished to a high degree of accuracy, using turret-mounted JETracer slide tool.

Like to hear the facts on how the Fastermatic lets you utilize smart tooling...eliminate human errors...get record production on long runs, automatic cycle operating advantages on short runs? Contact your Gisholt Representative. He has the facts, and his wide experience may suggest new methods to improve your profit picture.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

WRITE GISHOLT TODAY for advance data on the new Gisholt MASTERLINE Fastermatic Automatic Turret Lathe. Ask for Bulletin No. 1179.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT-FACTORY REBUILT MACHINES WITH NEW MACHINE GUARANTEE

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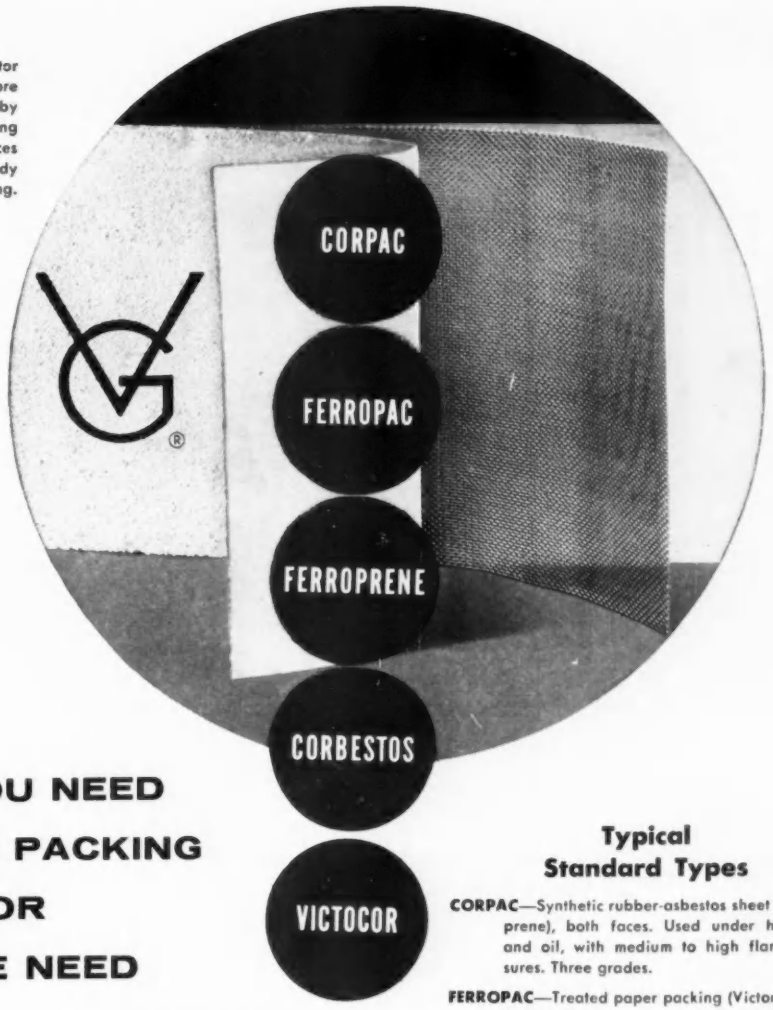
LOCKED-FOR-LIFE Victor construction. Packing and core are permanently bonded by means of formed tang projections on both faces of core, clinched into body of packing.



WHERE YOU NEED STEEL CORE PACKING VICTOR FILLS THE NEED

Where you're sealing under heavy loading, pounding or temperature, steel core packing is the modern specification. Its greater benefits and values are firmly established.

Actually it's the core that maintains a tight seal under tough conditions. It holds the packing in place, prevents shifting and extrusion. It resists torque loss on flattening because its effect on packing compressibility is nil.

From the widest range of highly engineered, SAE-ASTM rated packings, Victor literally can "tailor-make" steel core gaskets to your most precise specifications. Where needed, Victor successfully modifies the characteristics of standard types with virtually unlimited combinations and structures.

Get unbiased recommendations with complete technical and application data from your local Victor Field Engineer. Or contact the factory directly. Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. Canadian Plant: St. Thomas, Ont.

Typical Standard Types

CORPAC—Synthetic rubber-asbestos sheet (Asbestoprene), both faces. Used under high heat and oil, with medium to high flange pressures. Three grades.

FERROPAC—Treated paper packing (Victorite), both faces. For service against gasoline, oil, grease, water, under medium flange pressures. Holds up under frequent dismantling.

FERROPRENE—Compressed asbestos sheet packing (Victopac) one side, compounded synthetic rubber (Victoprene) on other. Useful under high heat and oil; low to medium flange pressures.

CORBESTOS—General-purpose, beater-treated asbestos sheet packing for use on oil, gasoline, water, steam, antifreeze. Adaptable to all temperature and bolting pressure needs. Six standard structures including double-sided, single-sided, steel-faced and laminated.

VICTOCOR—Compressed asbestos sheet packing, both faces. Low torque loss. High heat and crush resistance. For high flange pressures on hot oils, gasoline, water, antifreeze.

Test samples of these packings supplied free. Please state proposed application.

VICTOR

Sealing Products Exclusively

GASKETS • PACKINGS • OIL SEALS • MECHANICAL SEALS

A story without an ending!

The Versatility of TAYLOR Vulcanized Fibre

What this material is . . .

Vulcanized fibre is truly one of the wonder materials of all times. It is hard and dense, with excellent physical, mechanical and electrical properties. It is tough and resilient—has high resistance to impact, abrasion, wear, organic solvents, oils and gasoline. It is attractive and light in weight.

What can be done with it . . .

Vulcanized fibre can be machined, turned, stamped and punched. It can be formed, sawed, drilled, planed, milled and chiseled. It can be hammered, shaved, threaded, buffed and sanded. It can be decorated by lacquering, painting, printing and engraving. It can be laminated.

How it can be used . . .

Vulcanized fibre can be used for welders' helmets, golf club face inserts, carrying cases, track and motor insulation, and abrasive discs. It can be used for switch parts, gears, sliding door guides, shuttles, bobbin heads, labels and tags; for facings, table tops, partitions and kitchen utensils. There is no end to the things that can be done with it and the applications for which it is suited.

For more complete information on the forms and grades available, contact TAYLOR FIBRE CO., Norristown 49, Pa.

Taylor

LAMINATED PLASTICS VULCANIZED FIBRE

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CALENDAR

OF COMING SHOWS AND MEETINGS

Instrument Society of America, fifth annual symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston, Tex. ..... May 18-20

Chemical Specialties Manufacturers Association, midyear meeting, Drake Hotel, Chicago, Ill. ... May 18-20

Society for Experimental Stress Analysis, spring meeting and exhibition, Sheraton Park Hotel, Washington, D. C. ..... May 20-22

National Industrial Conference Board, annual meeting, Waldorf-Astoria Hotel, New York, N. Y. ..... May 21-22

Commercial Chemical Development Association, Spring Resort Meeting, Pocono Manor, Mt. Pocono, Pa. ..... May 25-26

American Society for Quality Control, annual convention and exposition, Hotel Sheraton, Cleveland, O. ..... May 25-27

ASME Design Engineering Show and Conference, Convention Hall, Philadelphia, Pa. .... May 25-28

American Petroleum Institute Division of Marketing, midyear meeting, The Savery, Des Moines, Iowa ..... May 27-29

10th Annual Industrial Research Conference, sponsored by Columbia University, Dept. of Industrial and Management Engineering, Arden House, Harriman, N. Y. ..... May 31-June 5

Fifth World Petroleum Congress, Coliseum, New York, N. Y. May 31-June 6

Third Annual Summer Conference on Vacuum Metallurgy, New York University College of Engineering, University Heights, Bronx, N. Y. ..... June 1-3

Institute of Management Sciences, American national meeting, Pick-Congress Hotel, Chicago, Ill. ..... June 4-6

Material Handling Institute Exposition, Public Auditorium, Cleveland, O. ..... June 9-12

Pressed Metal Institute, national sales seminar for metal stamping industry, Bedford Springs Hotel, Bedford, Pa. ..... June 11-12

Manufacturing Chemists' Association, 87th annual meeting, The Greenbrier, White Sulphur Springs, W. Va. ..... June 11-13

International Conference on Powder Metallurgy, Hotel Biltmore, New York, N. Y. ..... June 13-15

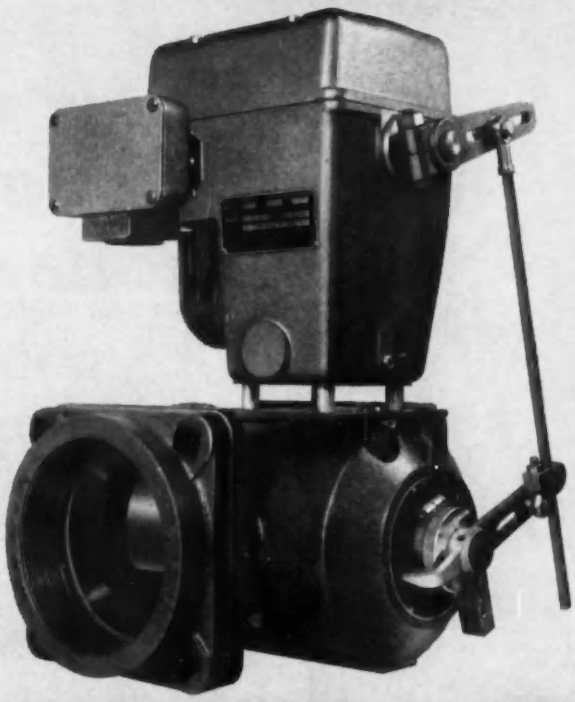
ASME Semi - Annual Meeting, Chase-Park Plaza Hotels, St. Louis, Mo. ..... June 14-18

SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. ..... June 14-19

Institute of the Aeronautical Sciences, summer meeting, Ambassador Hotel, Los Angeles, Calif. June 15-18

5th Industrial Finishing Exposition, sponsored by American Electroplaters Society, Detroit Artillery Armory, Detroit, Mich. June 15-19

Power, ruggedness and accuracy for modern electric control systems



New INDUSTRIAL VALVE MOTOR SERIES 831E

Honeywell's new Industrial Valve Motor for valve or damper operation . . . for applications requiring maximum power and ruggedness . . . high accuracy and reproducibility of control.

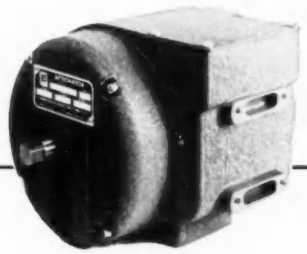
This new, powerful motor is available for on-off, 2-position, floating or proportional control. Its features include:

- **EXCEPTIONALLY HIGH TORQUE**—up to 62.5 foot pounds.
- **FAST SPEEDS WHEN NEEDED**—from 3 to 120 seconds—full travel.
- **INTERNAL BRAKE**—provides exact positioning without coasting, holds load in any position when de-energized.
- **EASY ADJUSTMENTS**—internal limit and auxiliary switches easily accessible and adjustable in the field.
- **ARC SUPPRESSION**—circuit protects contacts of controllers and relays.
- **PROPORTIONAL CONTROL**—models have over-travel protection for the slidewire.

For complete details on the new Series 831E Industrial Motor, write for Specification S-804-2, or call your nearby Honeywell field engineer. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control



ACTIONATOR* Series M630-M930

Gives dependable, low-cost service where the application calls for medium power.

Operate valves, dampers, louvers and other final control elements with this rugged, lightweight industrial motor. It's available with on-off, two-position, floating or proportional control. Its features include:

- **High torque ratings**—to 200 inch-pounds.
- **Fast speeds** available to meet application requirements.
- **Internal brake** to hold load in any position without coasting or hunting.
- **Easy adjustments**—readily accessible, field adjustable, cam-operated travel and auxiliary switches.

For details, write for Specification S-804-3, or call your nearby Honeywell field engineer.

**Tradename Minneapolis-Honeywell Regulator Co.*

Circle 217 on Inquiry Card, for more data

UP TO 99.99%

if it uses WESTERN FELT!

Such efficiency is possible in a Hersey reverse-jet filter with particle size of 5 microns and a pressure drop of ½ inch of water.

Felt can be used to filter solids from solids, solids from liquids, or solids from gases. It is used effectively in fuel filters, air filters, chemical filters, respirators, or dust collectors.

Microscopic barbs on the live fibers of Felt make felt the ideal filtering medium. These scales collect and hold dust particles. They also encourage "build-up" or caking which actually increases filter efficiency. At the same time, their natural interlocking action holds fibers tightly together, through years of flexing.

For helpful engineering information on filtration felts, write

WESTERN Felt WORKS

Dept. A
4021-4139 Ogden Ave.
Chicago 23, Ill.

MANUFACTURERS AND CUTTERS OF WOOL FELTS

Circle 111 on Inquiry Card, for more data

valve gear for any engine

Hydraulic and Mechanical Tappets (Barrel or Mushroom Type) of Alloy Steel, Hardened Alloy Cast Iron, Chilled Iron, or Alloy Chilled Iron • Push Rods • Adjusting Screws • Retainers

No matter what your valve gear requirements, it will pay you to check with Chicago's Tappet Division. For here you get the benefits of specialized techniques and facilities which, in 25 years of producing tappets and other valve gear, have established long records of trouble-free service . . . verified in over 25 million engines.

Chicago's special staff of tappet engineers can provide complete valve train designs for all types of engines . . . car, truck, tractor, diesel . . . aircraft, outboard, power mower, or industrial.

Their particular skill in development engineering will also prove a valuable addition to your own engineering staff. And the unique manufacturing and precision testing facilities especially developed by Chicago for valve train production provide you assurance of dependability and long life.

Whatever your valve gear problem, just call Chicago's tappet engineers today. You will find it advantageous to contact Chicago *while you are still in the preliminary design stages.*

THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

Circle 112 on Inquiry Card, for more data

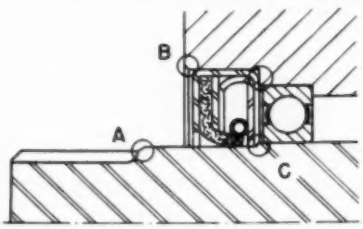
NATIONAL OIL SEAL LOGBOOK

4 common shaft sealing conditions

. . . and engineering tips that can help you "design-in" better oil seal performance

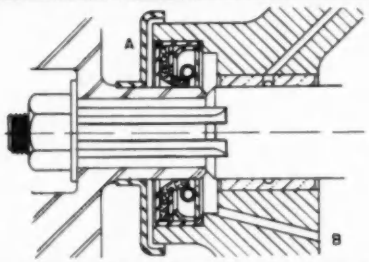
CONVENTIONAL INSTALLATION

Here a standard-design single lip seal retains lubricant and excludes normal dirt, dust and moisture. Sealing lip points in since seal's principal job is retaining oil or grease around bearing. Note that shaft is stepped and chamfered at "A" to prevent damage to sealing lip during installation. At "B", bore is chamfered to facilitate seal entry. At "C", counterboring insures accurate positioning of the seal.



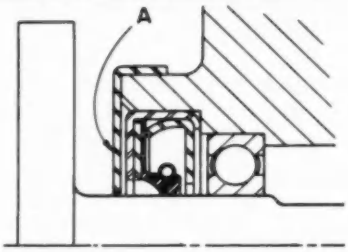
HEAVY DIRT CONDITIONS

Here is a commonly used method of protecting the seal and increasing seal life on applications subjected to extreme dirt conditions. The guard baffle at "A" is welded or swaged to the wheel hub to exclude the major portion of dirt and dust. The drain hole at "B" relieves pressure at the sealing point. In addition to the guard baffle, many manufacturers employ a dual-lip seal to insure bearing protection under extreme dirt conditions.



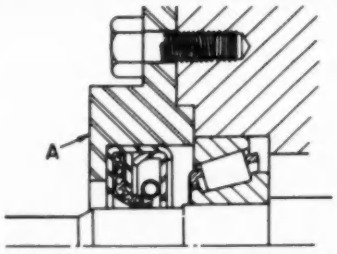
SEALING LONG, HEAVY SHAFT

Many cases of so-called "seal failure" are due solely to poor installation techniques. While today's seals are rugged, they can be rendered non-serviceable if distorted out of round, cocked in the bore, or if the sealing lip is torn. To protect the seal against such physical damage during installation involving a long shaft, a seal protector as shown at "A" may be mounted on the hub O.D.



INSUFFICIENT DEPTH TO MOUNT SEAL

Where the housing does not provide sufficient depth for counterboring, or where seal installation would be difficult or likely to damage the seal, a separate mounting member ("A") can be employed. As before, the shaft should be chamfered to prevent damage to the sealing lip during installation.



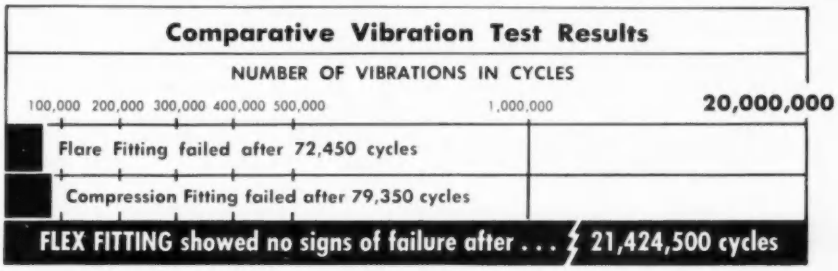
NATIONAL SEAL
Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California
Plants: Redwood City and Downey, California
Van Wert, Ohio

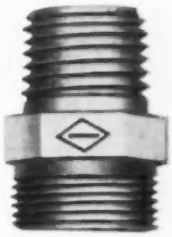
5207

Circle 113 on Inquiry Card, for more data

IMPERIAL *Engineering and Data File*

ENGINEERED TUBE FITTINGS — VALVES — TUBING TOOLS


Comparative Vibration Test Results
NUMBER OF VIBRATIONS IN CYCLES
100,000 200,000 300,000 400,000 500,000 1,000,000 20,000,000
Flare Fitting failed after 72,450 cycles
Compression Fitting failed after 79,350 cycles
FLEX FITTING showed no signs of failure after . . . 21,424,500 cycles



Flex tube fittings withstand over 20-million cycles of vibration without failure

To cope with major vibration in fuel, oil, and vacuum lines serving cars, buses, tractors, trucks, and power units — nonrigid tube connections are preferred. Imperial Flex tube fittings have been proven to withstand over 20-million cycles of vibration without failure! (See bar graph above.)

Such top operating dependability is but one of the money-saving advantages of Imperial Flex fittings. These fittings also eliminate costly flexible hose lines except where there is extensive tube movement.

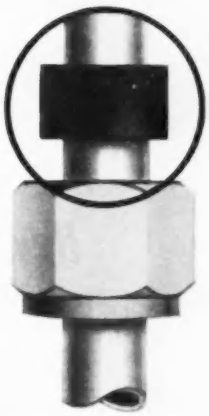
Design engineers point out that tube failure is caused by fracture due to metal fatigue and crystallization — a result of constant shock and vibration. Another cause for failure is tube distortion in making the connection.

ELASTIC SLEEVE — To overcome these and other rigid fitting joint handicaps, Imperial designed an elastic sleeve to cushion and absorb vibration. This special synthetic sleeve permits the tube to flex back and forth while continuing to maintain a positive, pressure-tight seal.

These reliable Flex fittings can be used for connecting all types of seamed and seamless metal tubing: copper, aluminum, thin-wall steel (such as Bundy or GM), Monel, stainless steel, Everdur and many others.

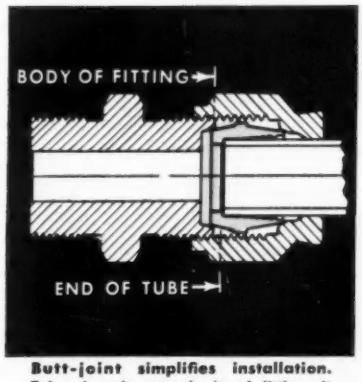
EASY INSTALLATION — To install Imperial Flex fittings for tubing ½" O.D. or smaller, just slip nut and flex sleeve over tubing. Insert tubing in fitting body as far as it will go and assemble. Positive stop nut prevents over-tightening.

Write for Catalog No. 344



No metal-to-metal contact with Imperial Flex fittings! Husky, resilient sleeve (encircled) withstands gas and oil . . . flexes perfectly in sub-zero to 250° F. temperatures. For ⅛" to ⅞" O.D. tubing.

Imperial Hi-Seal tube fitting design offers greater reliability, simplifies installation of hydraulic systems



Butt-joint simplifies installation. Tube doesn't enter body of fitting. It bottoms on shoulder of sleeve. No tube torqueing when making joint.

Users have obtained these benefits: (1) cuts space requirements up to 50%; (2) reduces number of bends required; (3) cuts man-hours and installation time; (4) substantially reduces the amount of tubing needed.

With Hi-Seal, the tube *does not* enter body of the fitting — it bottoms on shoulder of the sleeve. No need to spring tubing. Closer tube bends are possible — no flaring or threading is necessary. These dependable joints stay pressure-tight beyond the burst strength of the tubing itself!

Shipped fully assembled, Hi-Seal tube fittings are available in brass, steel and stainless steel, for ¼" to 1½" O.D. tubing. Long dryseal pipe threads are provided on all pipe ends.

Write for Bulletin No. 3061

Hi-Seal conforms to J.I.C., A.S.M.E. and A.S.A. standards.

CONTACT YOUR IMPERIAL REPRESENTATIVE OR WRITE TO:

THE IMPERIAL BRASS MFG. CO.
Dept. AI-59, 6300 W. Howard St.
Chicago 48, Ill.

Please rush me:
Bulletins ☐ No. 344 ☐ No. 3061

Name .....
Title .....
Company .....
Street .....
City ..... Zone ... State .....

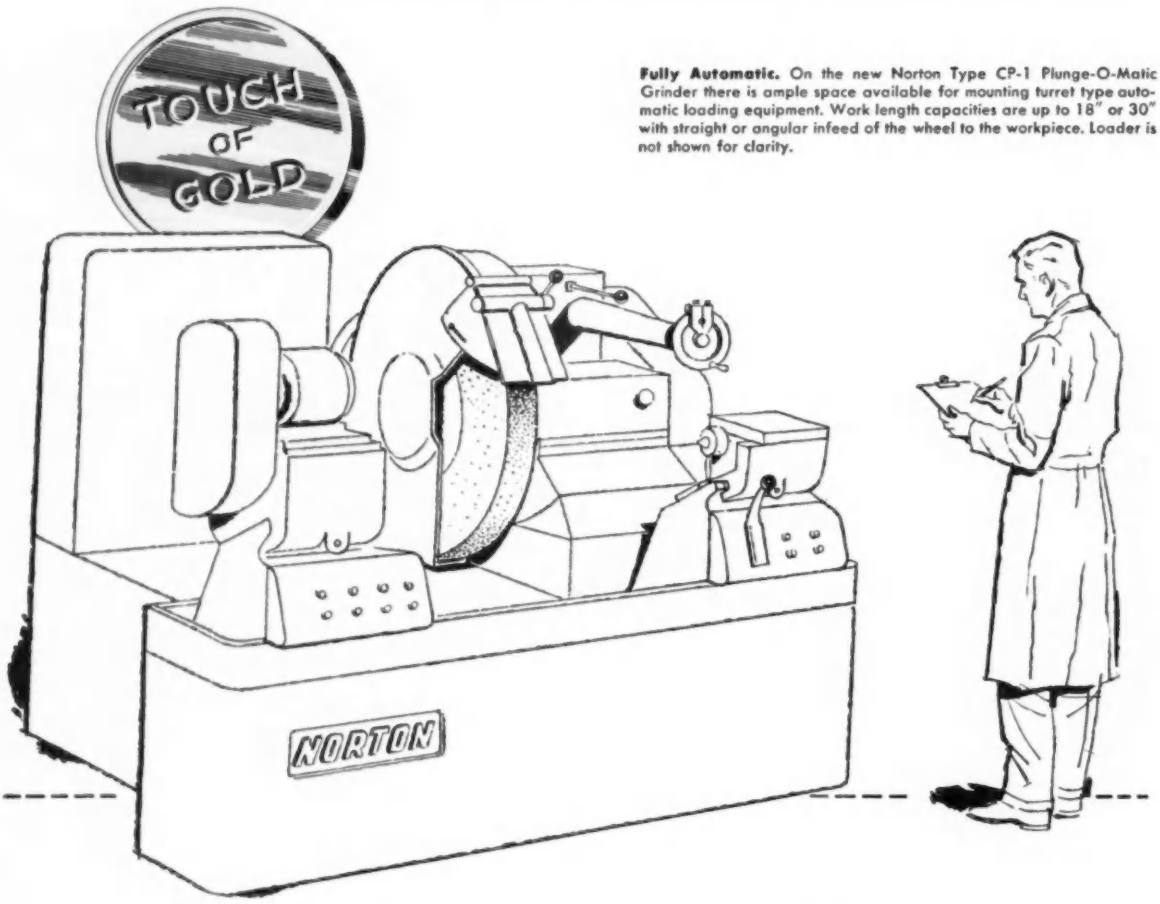
IMPERIAL

THE IMPERIAL BRASS MFG. CO.
6300 W. Howard St., Chicago 48, Illinois
In Canada: 18 Hook Ave., Toronto, Ontario

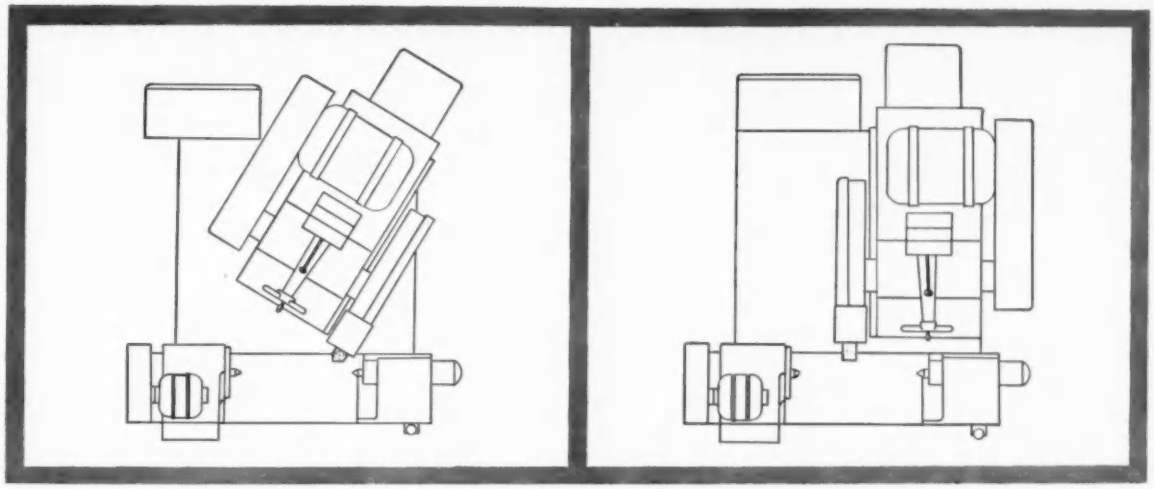
Circle 114 on Inquiry Card, for more data

Built for one big purpose!

New Norton Plunge-O-Matic* Grinder simplifies



Fully Automatic. On the new Norton Type CP-1 Plunge-O-Matic Grinder there is ample space available for mounting turret type automatic loading equipment. Work length capacities are up to 18" or 30" with straight or angular infeed of the wheel to the workpiece. Loader is not shown for clarity.



Versatility of design allows positioning the wheelhead as required for the job. Those shown are only two of many possible variations.

automatic loading for mass production grinding

In design, the Norton Type CP-1 Plunge-O-Matic Grinder is brand new. While retaining outstanding proven features of Norton cylindrical grinders — and co-ordinating them with a new turret type loader for fast, automatic plunge grinding — it has no unnecessary mechanism.

As traverse grinding is not involved, swivel and sliding tables, hydraulic table cylinder and attendant control valving have been eliminated. Taper adjustments are made in the automatic truing device located in the wheelhead. The base contains no inner mechanism, its sole function is to rigidly support the headstock, footstock, wheel slide and loader.

This machine provides for automatic loading — a new departure from the usual cylindrical grinder design. On the Plunge-O-Matic Grinder the gap in front of the grinding wheel is 19" deep by 18" or 30" work length — ample space to accommodate the new turret loader. And since one type of loader can handle many parts, only the loader insert, which actually holds the parts, needs specific designing. This reduces the original cost and operating maintenance of automatic loading.

The Plunge-O-Matic wheel slide, unitized and entirely independent, carries grinding wheels of 30" or 36" diameter and can be located as desired on the base. Complete flexibility for angular grinds is assured, and heavy duty grinding with wide or multiple wheels can be provided for.

Your Norton Sales Engineer, a trained specialist in grinding, will be glad to give you more facts about the Plunge-O-Matic Grinder — with an accurate estimate of how much you can save. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

NORTON
GRINDERS *and* LAPPERS
Making better products
to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

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LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

Now-28 ISOBRITE® PLATING BRIGHTENERS

For Zinc, Cadmium, Copper and White Brass

HAVE THE *FOUR* BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what *you* wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

1. LONGER LIFE

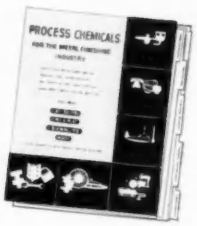
Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.



4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies." Or, write for technical data and product list giving details of your operations.

Allied Research Products, Inc. 4004-06 EAST MONUMENT ST., BALTIMORE 5, MD.
Branch Plant: 400 Midland Avenue, Detroit 3, Michigan
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromate Coatings | IRILAC™ Clear Coatings | ISOBRITE® Brighteners | ARP® Plating Chemicals | WAGNER Equipment

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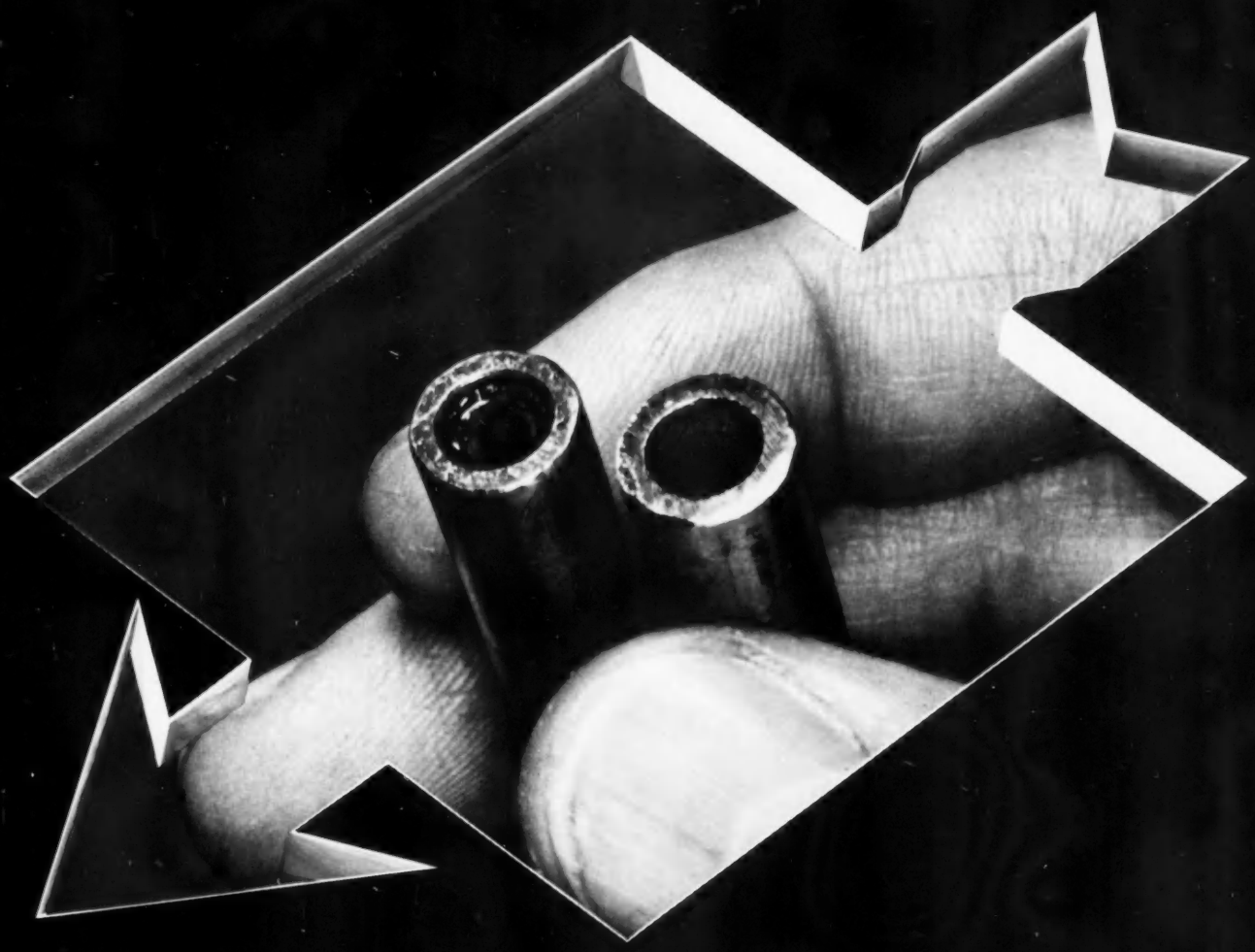
Quality–the best economy of all



Two oils...two lines...one clogged...one cleaned

A Sunvis 700 oil and a regular oil were run through two equally clogged hydraulic lines. The regular oil couldn't remove the sludge. The Sunvis 700 oil cleaned its line thoroughly. That's one job it's made for . . . to clean out sludge deposits in hydraulic lines while it transmits power.

With a Sunvis 700 oil—like every Sunoco oil—you enjoy the best economy of all: the economy of quality. A Sunvis 700 oil lasts longer. The machinery it protects lasts longer. It prevents rust . . . ups output by reducing downtime.

FREE Trouble-Shooting Chart will help you spot and cure common hydraulic system troubles. For your copy, write to:

Sun Oil Company, Philadelphia 3, Pa., Department I-12.

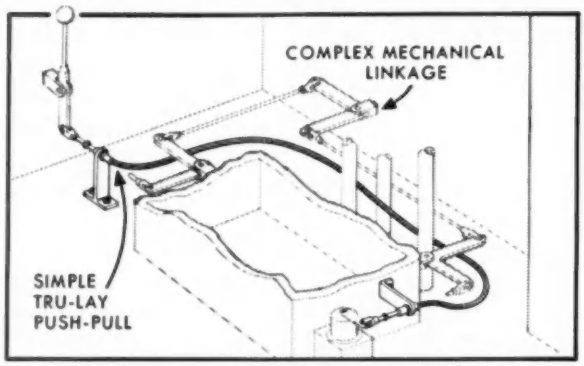
MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO

with TRU-LAY PUSH-PULL controls, you can---

MAKE HUNDREDS OF PRODUCTS MORE USEFUL, EASIER TO SELL

Tru-Lay Push-Pull controls provide positive remote action over long or short distances. Because they operate while flexing, they can snake around obstructions. They are ruggedly constructed, easily installed and operated, and are sealed against dirt and moisture. Push-Pulls are simple, have but one moving part, are noiseless, and give a lifetime of accuracy. Linkages, on the other hand, are complex. They're made of many parts, wear at many points, and produce increased backlash, lost accuracy, and vibration rattles.



Here's Why Push-Pull Controls Simplify Design, Give Better Performance

Long Life—We have never heard of a Tru-Lay Push-Pull wearing out in normal service.

Dependable Operation—Top performance under the most adverse conditions...in temperatures ranging from −70°F to the high levels of jet engine operation...in wet locations...in abrasive atmospheres.

Freedom from Trouble—Inner working member is fully protected by tough, flexible conduit...lifetime factory lubrication...sealed against entrance of dirt, moisture, and other foreign matter...cold swaging of all fittings.

Accuracy—Built to the most exact standards of quality and precision. On automobile pushbutton transmissions, for instance, Push-Pull controls provide five positions with a total movement of only .560".

Capacity—Push-Pull controls will handle jobs with as much as 1,000 lbs. input, 150 feet or more from the control point.

Adaptability—Push-Pull controls can be adapted to countless applications. Standard anchorages, fittings, and heads meet almost any requirement, and modifications can be made to fit special situations.

Design Engineers Report on Benefits

Saves Time, Labor, and Material
"We use Push-Pulls to operate clutch controls on the main power unit, feed conveyors, and delivery conveyors...and we save the time, labor, and material required for planning and engineering the old linkages."

Greater Flexibility of Design
"Push-Pulls give us flexibility in locating the hydraulic control valve in relation to the operator's position."

Cost Less to Install
"They are easier and less expensive to install than linkages for remote control of power take-off."

Solution to Tough Problem
"Can be installed where straight rods are impossible."

Eliminates Maintenance
"No maintenance whatsoever; not even lubrication is required."

Reduces Number of Parts
"Your Push-Pulls have eliminated links, radius rods, and other lost-motion devices for remote control of hydraulic valves."

Provide Accurate Control
"We get minimum backlash because the cable is designed to close tolerances with minimum drag and lost motion."

Push-Pulls Can Help Solve YOUR Remote Control Problems

Push-Pull controls are solid as a rod and flexible as a wire rope. You can use them in the electrical, hydraulic, and pneumatic systems on construction equipment, on farm implements...almost *anywhere* convenient remote control is desired. For complete details on how you can use them, write for a copy of the Push-Pull Data File. It contains 7 bulletins which describe in detail the operation of Push-Pulls, their applications, features, and advantages. Our engineers will be glad to help you make Tru-Lay Push-Pull controls a part of your product.

Automotive and Aircraft Division
AMERICAN CHAIN & CABLE

ACCO
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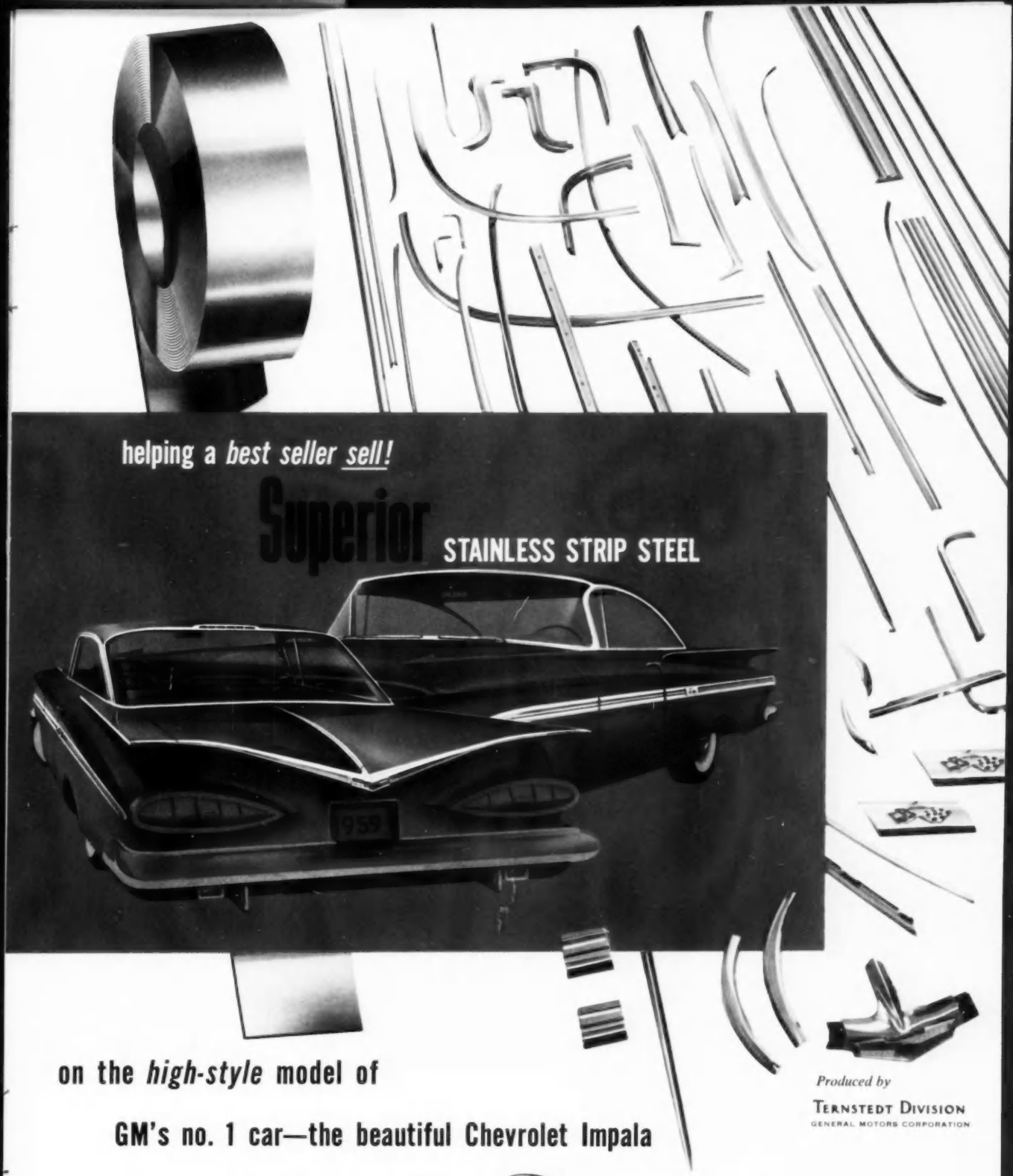
Circle 119 on Inquiry Card for more data



on the *high-style* model of

GM's no. 1 car—the beautiful Chevrolet Impala

Yes, every one of these 48 precisely-contoured *stainless steel* parts is used on the exterior body trim of the 1959 Chevrolet *Impala*. Here you see beauty, brilliance and strength that resist weather and wear without care for the life of the car—selling and re-selling at every turn. ● We are proud of Superior Stainless Strip Steel's applications in the fine automobiles of General Motors. Can we serve *your* stainless strip needs?

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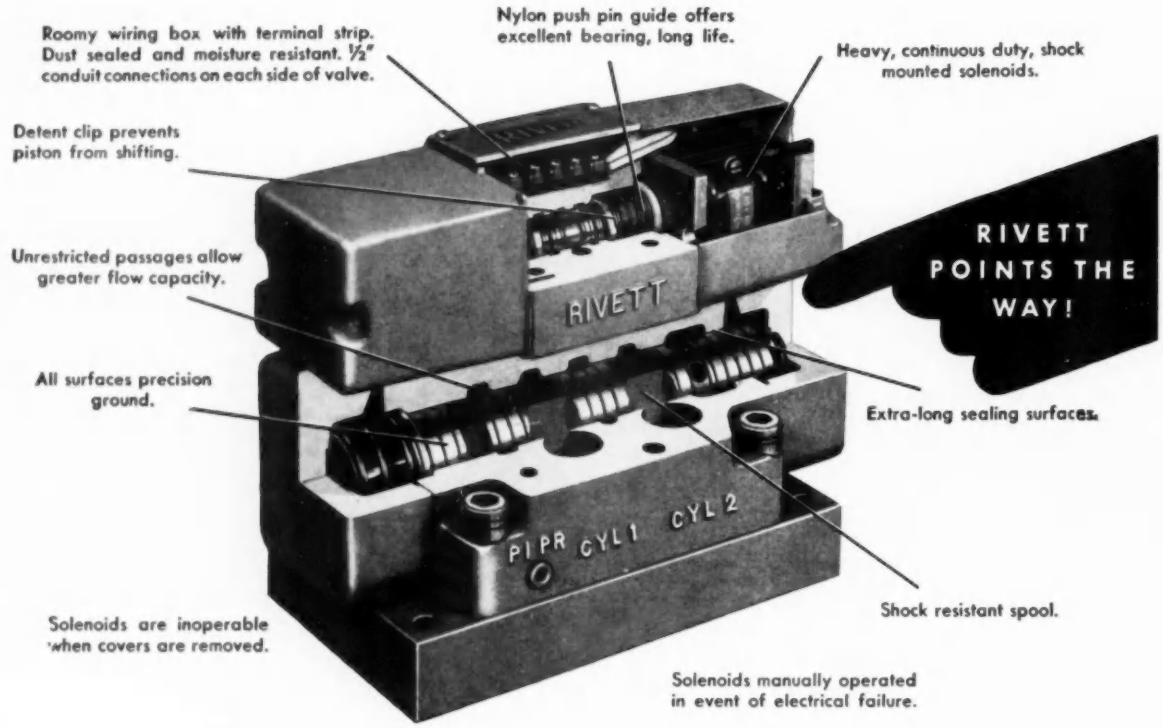
Roomy wiring box with terminal strip. Dust sealed and moisture resistant. ½" conduit connections on each side of valve.
Nylon push pin guide offers excellent bearing, long life.
Heavy, continuous duty, shock mounted solenoids.
Detent clip prevents piston from shifting.
RIVETT POINTS THE WAY!
Unrestricted passages allow greater flow capacity.
All surfaces precision ground.
Extra-long sealing surfaces.
RIVETT
P1 P2 CYL 1 CYL 2
Shock resistant spool.
Solenoids are inoperable when covers are removed.
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High Flow Capacity!

Rivett's New Solenoid Pilot Operated Hydraulic 1" Valve Is Rated at 28 G.P.M. and the 1½" Size At 82.5 G.P.M., At 15 Ft. Per Sec. Velocity.

- Reduces Back Pressure, Friction, Heat
- Opens and Closes Smoothly, Positively
- Mounts In Any Position
- 3000 P.S.I. Operation for Multi-Million Cycles
- Optional: Built-in Speed Controls
  Explosion Resistant
  Solenoid Enclosures

Forget about back pressure by specifying Rivett 6600's for service up to 3000 P.S.I. Reduce inventory! Select off the shelf: 2 basic sizes fit ⅜", ½", ¾", 1", 1¼" and 1½" I.P.S. Single and double solenoid. 7 spool designs. Meet *all* J.I.C. requirements.

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Get Catalog No. 261 to aid your circuit design. Complete drawings, specifications, cut-away views, tables, diagrams!

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"100"
HYDRAULIC VALVES

Member National Fluid Power Association

Reducing total installed costs is no heads or tails affair with the AMP electrical/electronic circuit terminating method. There's no clutter or extra material, no temperature problems, multi-step assembly or snarled-up inventory mess. The AMP method is simplicity itself–just the terminal and the tool that go together like the two sides of a coin–never one without the other.

Production rates with A-MP tools are astonishing–up to 4,000 finished wire terminations an hour, with but one A-MP automachine and one operator. As for precision, no other wire terminating method can match the assured uniformity and reliability of the A-MP terminal and tooling team–a team that turns out an endless parade of unexcelled terminations . . . all as identical as newly minted coins. There are no doubtful attachments, no hidden defects to slip by your inspection department. Speed, simplicity, uniform reliability–this means a lower installed cost per electrical circuit termination over all other methods. Nothing is left to chance with the AMP Cost Saving Method. You can bank on it.

Send for our new Cost Saving Brochure.

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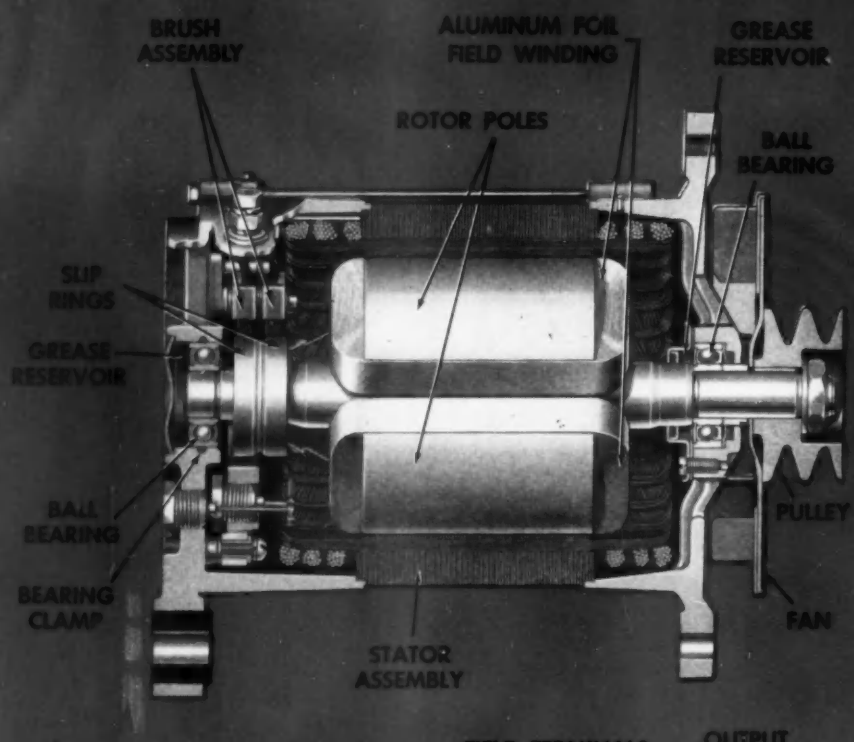

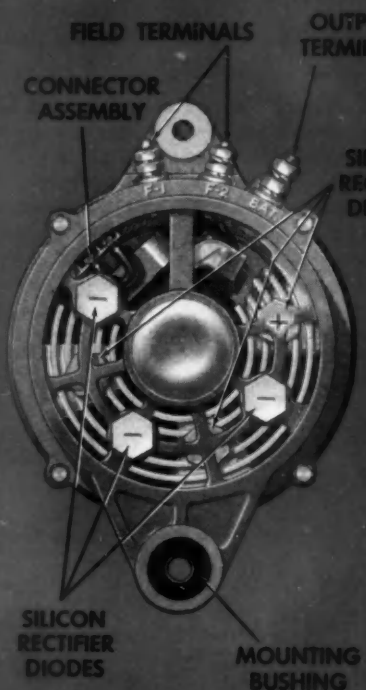

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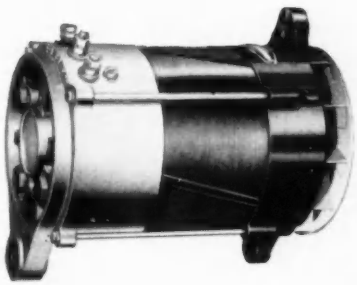
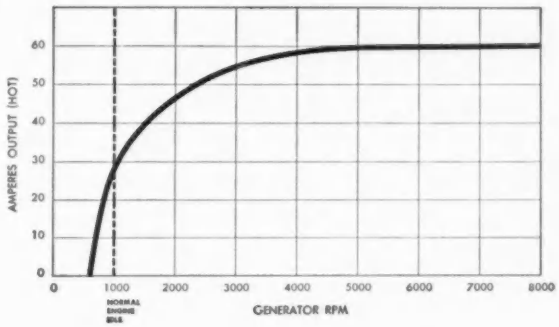
WHEN YOU REPLACE STANDARD D.C. EQUIPMENT WITH DELCO-REMY'S NEW SELF-RECTIFYING A.C. GENERATOR





Here's a completely new generator from Delco-Remy *specifically designed* to take care of cars and trucks with extra-heavy electrical loads under all traffic conditions . . . to increase battery life by eliminating deep cycling.

Designed to mount interchangeably with most standard d.c. generators, this compact new unit is only 5¾" in diameter and weighs just 31 pounds. The a.c. design eliminates commutation problems, providing extra-long brush life . . . and the ball bearings are "lifetime" lubricated so that no attention is required between engine overhaul periods. Six specially developed silicon rectifiers built into the end frame eliminate the need for space-consuming external rectifier units, reducing installation time and cost to a minimum.

Be sure to specify this new self-rectifying a.c. generator along with its companion transistor regulator (either full or transistorized model) on your new special-duty equipment for 1959. This all-new power team is still another example of Delco-Remy progressive engineering at work for you.

GM GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY—STARTING WITH **Delco-Remy** ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

Circle 122 on Inquiry Card, for more data

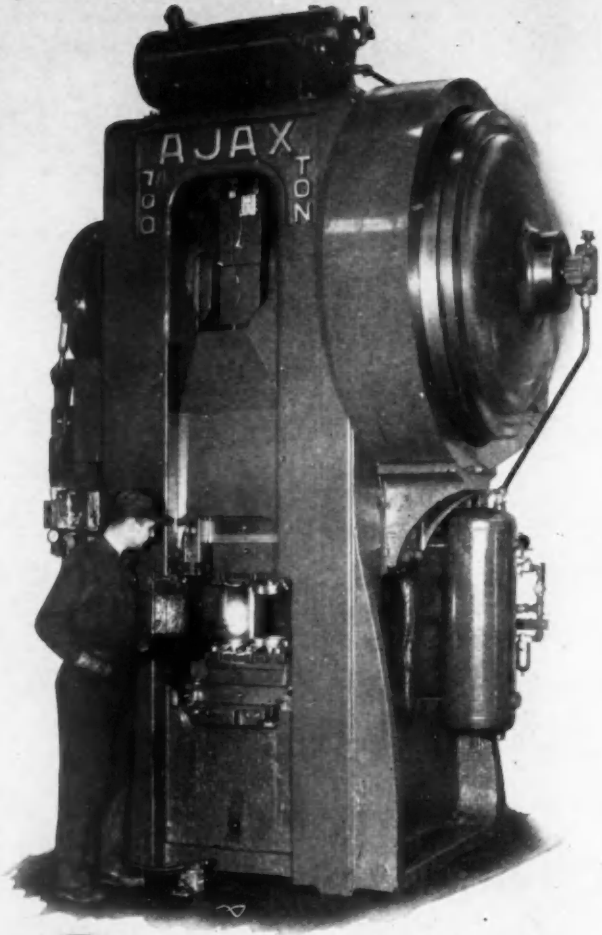
Forging Gear Blanks to Close Tolerances . . . on AJAX *High Speed* Forging Presses

Pictured at the right is a 700 ton Ajax Forging Press in operation forging gear blanks at high speeds in one heat.

The progressive forging operations necessary for forming this blank are shown below.

These and other multi-stage forgings are forged economically to close tolerances with a minimum of flash in Ajax Presses at high rates of production.

For your forging needs Ajax designs and builds presses from 300 tons to 8000 tons capacity.



700 ton Ajax Forging Press in operation.

PROGRESSIVE FORGING OPERATIONS FOR FORMING GEAR BLANKS

Write for Bulletin 75 C

THE **Ajax** MANUFACTURING COMPANY

CLEVELAND 17, OHIO

110 S. DEARBORN ST., CHICAGO, ILL.

W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

Circle 123 on Inquiry Card, for more data

NOW—a New Temperature Sensitive

EATON VISCO-DRIVE

—a Thermostatically Controlled Fan Drive that Increases Usable Horsepower and Reduces Fan Noise

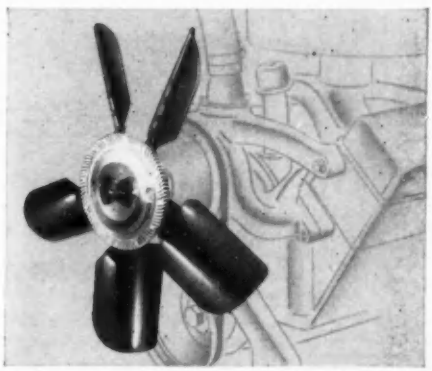
WHEN COOLING IS NOT REQUIRED: The fan idles when under-hood temperature is below the thermostatic setting. The slide-valve is closed preventing fluid from entering the viscous-drive chamber.

WHEN COOLING IS REQUIRED: Fan speed increases with rise in under-hood temperature. Thermostatically controlled slide-valve regulates the amount of fluid entering the drive chamber, increasing fan rpm accordingly.

The new Eaton Visco-Drive is automatically regulated by under-hood temperature. As under-hood temperature rises, the Visco-Drive automatically increases fan rpm to produce required cooling. Operational ranges can be established to suit the requirements of each vehicle model.

Thermostatically-modulated fan operation increases net output of engine when cooling is not needed; permits designing for greater cooling efficiency at low engine speeds without the disadvantage of fan noise at high speeds.

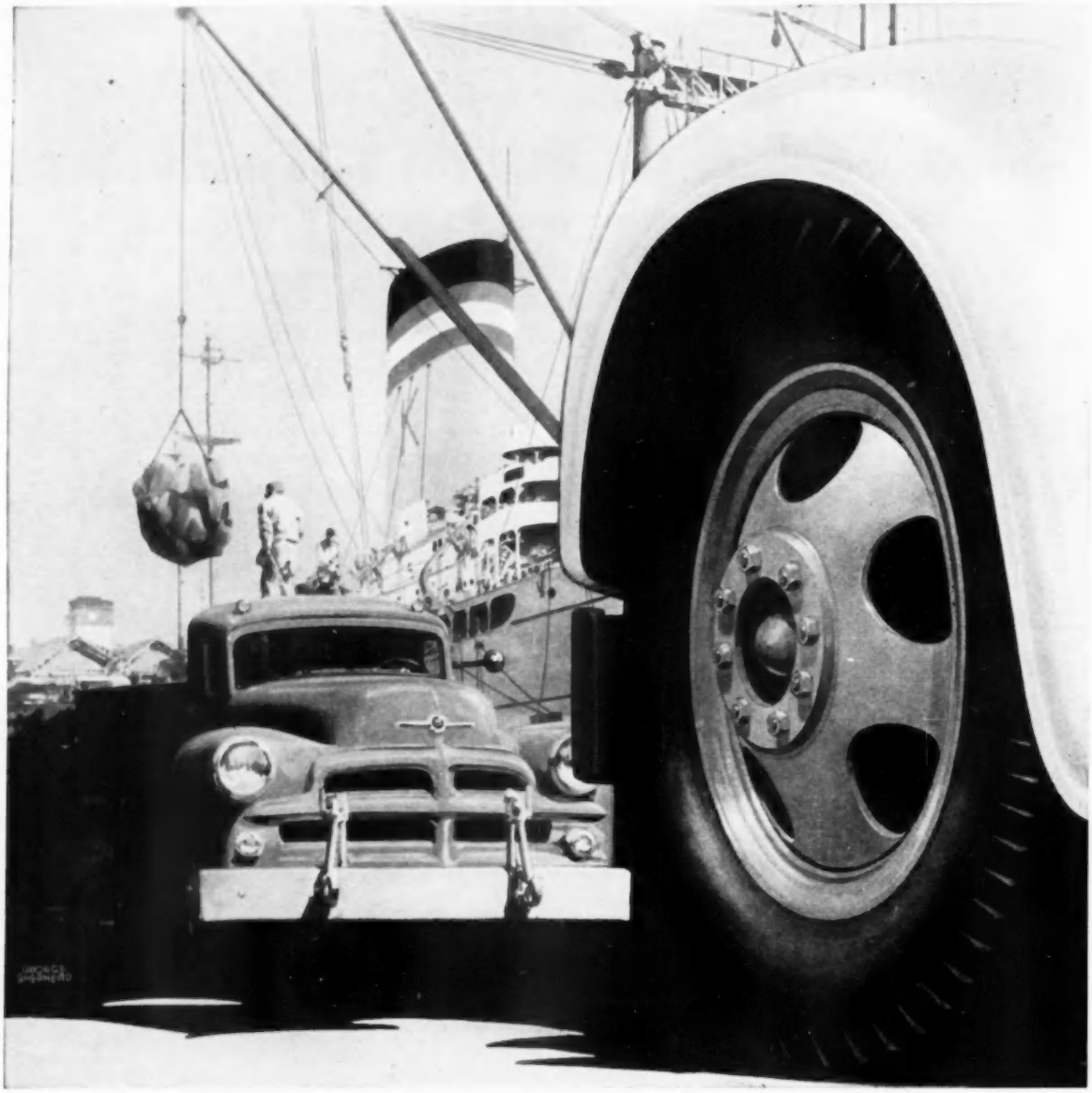
The Eaton Visco-Drive is of simple, functional design and light-in-weight construction. Field and laboratory tests have proven its dependability for application on all types of vehicles.



Ultra-compact design makes the Visco-Drive readily adaptable to your present installation with only minor changes.

Torque-Sensitive Eaton Visco-Drives are also Available.
Consult with Our Engineers on Your Fan Drive Needs.

EATON — PUMP DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN



Kelsey-Hayes helps keep the goods on the move

The cargoes of commerce roll on wheels by Kelsey-Hayes—*pioneer producers of precision parts for the rugged vehicles of motor transport.* Fifty years of accumulated skills and experience uniquely equip Kelsey-Hayes as a supplier to the builders of commercial motorized equipment. Facilities unexcelled for mass production of wheels, brakes, hubs and brake drums, power brakes, transmission bands and custom quality metal stampings. Kelsey-Hayes Company, Detroit 32, Michigan.

KELSEY-HAYES

Automotive, Aviation and Agricultural Parts • Hand Tools for Industry and Home

18 PLANTS: Detroit and Jackson, Michigan; Los Angeles; Philadelphia and McKeesport, Pennsylvania; Springfield, Ohio; New Hartford and Utica, New York; Davenport, Iowa; Windsor, Ontario, Canada.

Circle 125 on Inquiry Card, for more data

Now! With All-New High Efficiency Regulator!

ALEMITE

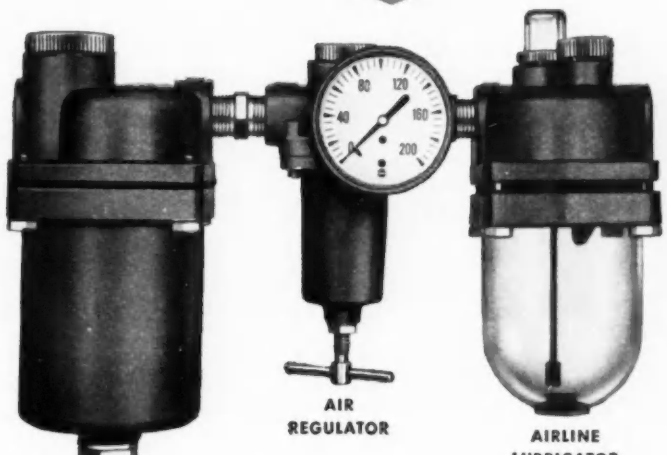
"Tri-Duty" Airline Controls

...FOR THE CLEANEST, DRIEST, BEST-REGULATED AIRLINE LUBRICATION...

Automatic Water Separator! Removes all of condensate, all the time. Traps dirt particles to prevent damage to sensitive airline devices. Handles all airline pressure up to 200 PSI and flow volume from 5 to 50 CFM.

New Air Regulator with Gauge! Assures accurately controlled air—prevents erratic operation and damage to equipment. Design permits inlet pressures of 250 PSI—adjustments up to 125 PSI. Excess air pressure "bleeds off," within regulator, instantly.

Automatic Airline Lubricator. Compensating ball valve design controls air flow. Oil particles are atomized for most efficient transmission through supply lines. Result—uniform mixture regardless of air pressure and volume. Oil and air mixture proportionately constant. Reservoir may be filled at any time, assuring continuous operation. Nine-ounce capacity.



WATER SEPARATOR

AIR REGULATOR

AIRLINE LUBRICATOR

ALL-NEW FEATURES OFFER OUTSTANDING ADVANTAGES:

- Ideal for air tools, air cylinders, air motors, etc.!
- Most efficient airline lubrication available!
- Specifically designed for extensive service life and peak efficiency under adverse operating conditions!
- Engineered to give greatest three-way protection, durability and efficiency . . . in a complete package!

Mail Coupon for Full Information!

Symbol of SW Excellence

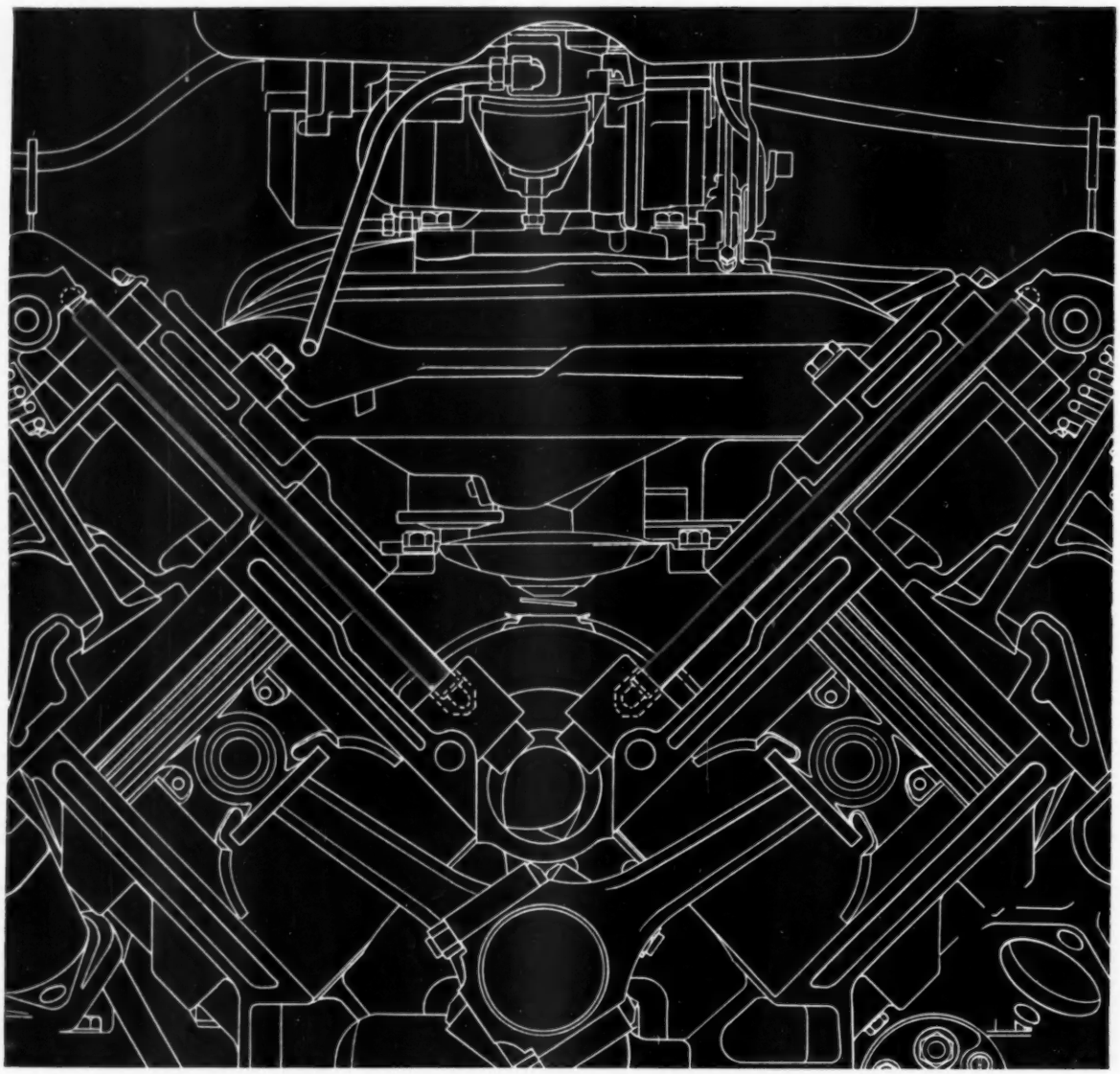
ALEMITE DIVISION
STEWART-WARNER CORPORATION

1850 Diversey Parkway, Chicago 14, Illinois

ALEMITE, Dept. U-59
1850 Diversey Parkway, Chicago 14, Illinois
Please send me all the facts about Alemite's new "Tri-Duty" Airline Controls.

Name_____
Company_____
Address_____
City_____ Zone_____ State_____

Lightweight Bundy Tubing push rods



Long proved in heavy-duty truck engines, Bundy Tubing improves the performance of powerful V-8 engines by reducing cam load, increasing the efficiency of the entire valve train.

BUNDYWELD IS DOUBLE-WALLED FROM A SINGLE STRIP

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

←

NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

help new V-8's deliver full power!

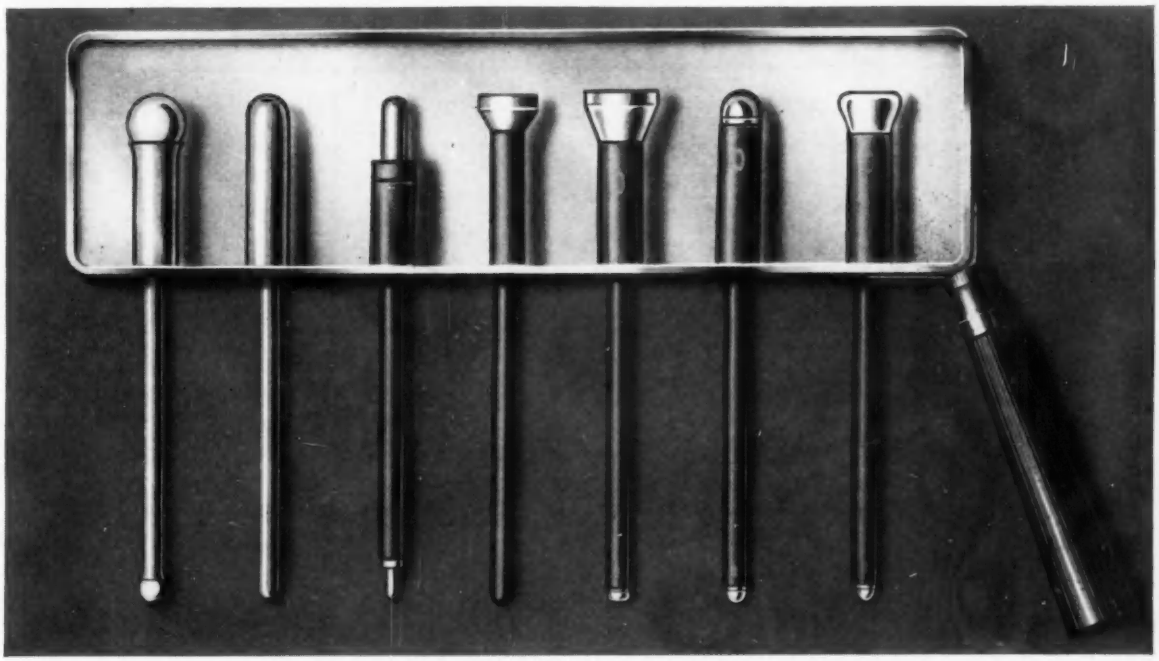
Exciting acceleration and flashing performance are trademarks of today's automotive engines. Since heavy, solid push rods reduce valve efficiency and rob new V-8's of power, many auto makers now insist on push rods of Bundy® Tubing.

Easily fabricated into strong, lightweight push rods, Bundy Tubing reduces cam load, increases the efficiency of the entire valve train. Engines "breathe" deeply, deliver full, designed-in power.

Cold-drawn to proper hardness and held to specified low-camber tolerances, Bundy Tubing is extremely fatigue-resistant, has high ultimate tensile strength. Unmatched dependability has made Bundy Tubing the standard for mechanical- or fluid-transmission applications in cars, trucks, and farm equipment. *In fact, Bundy Tubing is used on 95% of today's cars, in an average of 20 applications each.*

And at Bundy, you get even more than high-quality, low-cost tubing delivered on schedule. We offer free, expert engineering and design service, and fabrication facilities to mass-produce any tubing design to your exact specifications. For full information, call, write, or wire us today.

BUNDY TUBING COMPANY, DETROIT 14, MICHIGAN



Because Bundy Tubing fabricates more easily than the material it replaces, you get more uniform, better finished parts. Bundy offers free design help and fast fabrication service, too.

Bundyweld and Bundy specialty tubings are sold through distributors in principal cities

BUNDY® TUBING

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, BRAZIL, ENGLAND, FRANCE, GERMANY, AND ITALY

Circle 127 on Inquiry Card, for more data

Castings of

ARMASTEEL®

so tough they replace forgings so machinable...they reduce finishing costs

CLASSIFICATION	CHARACTERISTICS	HARDNESS (BHN)	MIN. TENSILE STRENGTH (PSI)	MIN. YIELD STRENGTH (PSI)	MIN. % ELONGATION IN 2 INCHES
ARMASTEEL GM 86M	Recommended for less highly stressed parts. Replaces steel parts in 1020-1035 S.A.E. range.	163-207	70,000	48,000	4.0
ARMASTEEL GM 85M	Recommended for moderate strength plus adaptability to selective hardening. Replaces parts in 1035-1050 S.A.E. range.	197-241	80,000	60,000	3.0
ARMASTEEL GM 84M	Recommended for high degree of strength. Replaces heat-treated parts in 1040-1050 S.A.E. range.	241-269	100,000	80,000	2.0
ARMASTEEL GM 88M	High resistance to wear and high yield strength, yet retains machinability. Requires no heat-treating and possesses same strength and wear characteristics as alloy steel forgings.	269-302	105,000	85,000	2.0

CENTRAL FOUNDRY DIVISION

Because ARMASTEEL castings are so machinable, so resistant to wear and shock, and so adaptable to selective hardening, they are rapidly replacing many parts formerly machined from bar stock or steel forgings.

ARMASTEEL, a pearlitic malleable iron, possesses the same strength and performance characteristics usually associated with plain carbon steel. In addition, ARMASTEEL contains excellent bearing properties, has high yield strength, good damping capacity, maximum rigidity and excellent fatigue life. Accurate control of heat-treating operations in the manufacture of ARMASTEEL produces a fine, uniform grain structure and provides excellent finishing qualities.

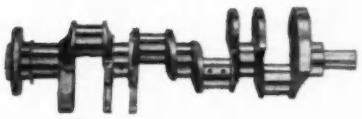
Four different types of ARMASTEEL can be cast to your specifications. One of the four (GM 84M, GM 85M, GM 86M or GM 88M) will have the physical properties to best meet the requirements of your application. For example, ARMASTEEL castings are being successfully used in the automotive, appliance and implement fields for such parts as gears, pistons, crankshafts, rocker arms and universal joint yokes, all of which utilize to best advantage the outstanding characteristics of ARMASTEEL.

Some of these applications are shown in the table. Look them over carefully; you may find that these characteristics and advantages of ARMASTEEL can help reduce your costs . . . increase your production . . . and improve the performance of your products.

Typical ARMASTEEL castings

Because of the greater physical properties of GM 86M ARMASTEEL, it was possible to redesign this anchor plate as shown and effect a weight reduction from 2.26# per piece to 1.44# per piece.

GM 86M ARMASTEEL provides the ideal casting for this automobile differential case because of its high strength, minimum deflection and good damping qualities which contribute to quietness of operation. Note the as-cast internal cavity and the well-formed webs.



GM 85M ARMASTEEL provides a crankshaft with more desirable machining characteristics than a forged crankshaft of SAE 1045 steel. Improves machining of journals and reduces cheeking stock. Use of GM 85M ARMASTEEL made possible the redesign of the crankshaft with a resulting 3.5# weight reduction and a lower material cost.

By converting to GM 85M ARMASTEEL, drilling and boring operations were eliminated on this crankshaft sprocket. Stock in rough part was reduced from 1.93# in forging to 1.00# in casting. Customer realized reduced piece price with GM 85M ARMASTEEL.

GM 84M ARMASTEEL was specified for this socket plate journal because its microstructure makes it more easily machined than steel with the same physical properties. It has better bearing and wear resistance qualities . . . less distortion during machining . . . and does not require heat treatment. Weight of part in rough is less than comparable steel forging.

Crankshaft for newly designed small gasoline engine. GM 84M ARMASTEEL specified because of outstanding success in similar engines. Less stock removal and better machinability are advantages over forged crankshaft.

This planet gear carrier was formerly forged from SAE 1141 steel, which required a heat treatment after rough machining and broaching operations. By converting to GM 88M ARMASTEEL, heat treatment was eliminated and the weight of the rough part was reduced.

By converting to GM 88M ARMASTEEL for this universal joint yoke, hole thru hub could be cast in . . . eliminating a drilling operation and reducing weight of part approximately 30%. GM 88M ARMASTEEL part has lower piece price than forging formerly used.

85

GENERAL MOTORS CORPORATION • SAGINAW, MICHIGAN • DEPT. 24

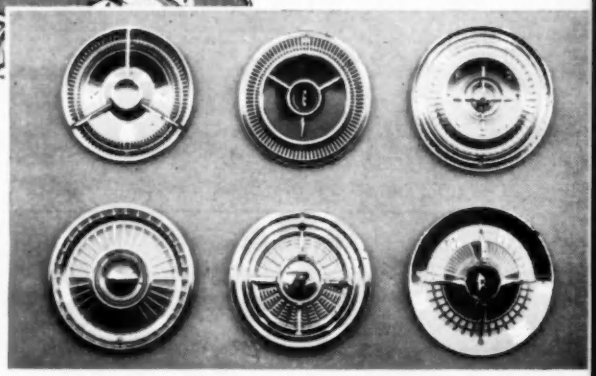
Brightness is Not Enough

Wheel covers must be more than just bright. They must have strength, spring temper, durability and low unit cost in volume production.

Other materials may claim some of these characteristics, but only stainless steel actually possesses all of them — and has a performance record to prove it.

It is easy to **make cheaper wheel covers.** Just forget that customer complaints, lost goodwill and the inevitable replacement of parts eventually show up on the balance sheet.

In wheel covers there is no substitute for stainless steel's lasting brightness, strength and durability.



Can you name the cars represented by these stainless steel wheel covers? A postcard request will bring you the answers.

Plants and Service Centers:
Los Angeles • Kenilworth (N. J.) • Youngstown • Louisville (Ohio) • Indianapolis • Detroit

STAINLESS
SHEET • STRIP • BAR • WIRE

Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34

Circle 129 on Inquiry Card, for more data

automation at its best!! as *only BAUSH can do it - -*

with Baush *completely mechanical* transfer machines using "S"-Type Leadscrew Units . . .

TO GIVE YOU:

Easy, economical maintenance with shop mechanics . .
Interchangeability of units . .
No expensive hydraulic oil . .
No costly hydraulic leaks . .
Positive, steady tool feed . .
No surge or tool breakage in break-thru . .
Longer life of motors, gears, spindles and guide bushings . .

WHY NOT TRY US?

B
BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Circle 130 on Inquiry Card, for more data

NOW shifting is made easier with

FULLAIR

CONTROL

The FULLAIR CONTROL master control unit, with ROADRANGER range selector handle. Spool-shaped finger latch prevents accidental engagement of reverse speeds.

. . . available for these 10-speed Fuller ROADRANGER Transmissions: R-96, R-960, RA-96, RA-960, R-63, RA-63, R-630D and RA-630D

Quick, easy engagement of all gears is literally at the driver's fingertips with FULLAIR CONTROL. Available on Fuller 10-speed ROADRANGER Transmissions, the FULLAIR CONTROL makes remote gear shifting effortless and positive because compressed air does all the work. Replacing the conventional gear shift lever is a small master control mounted conveniently near the driver's right hand. Movement of the short shift lever through the normal shift pattern identified on a slotted template actuates air valves, which in turn release compressed air to a slave unit on the transmission where it is used to select and engage the particular gear set chosen by the driver.

Mounted behind the FULLAIR CONTROL is the standard range selector handle familiar to all operators of ROADRANGER Transmissions. The selector handle is used with a FULLAIR CONTROL in identically the same manner as it is with R-96 Transmissions equipped with a standard gear shift lever.

The FULLAIR CONTROL brings a new dimension to remote control gear shifting. It offers the following advantages:

- **Positive and effortless gear shifting with air power**
- **Easy gear selection with gear positions identified on a slotted template of the master control**
- **Positive identification of neutral and in-gear positions by means of a light on the instrument panel**
- **No mechanical linkage**
- **Flexible air lines eliminate clearance problems encountered with mechanical linkage in tilt-cab and cab-over-engine type vehicles**
- **No rubbery feel during the shift. Slave unit responds instantaneously to motion in master control**

FULLAIR CONTROL is presently available with the following 10-speed Fuller ROADRANGER Transmissions: R-96, R-960, RA-96, RA-960, R-63, RA-63, R-630D and RA-630D. FULLAIR CONTROL will soon be offered with other Fuller Transmissions. Ask your truck or equipment dealer to give you complete details on the FULLAIR CONTROL.

FULLER — TRANSMISSION DIVISION — MANUFACTURING COMPANY

KALAMAZOO, MICHIGAN

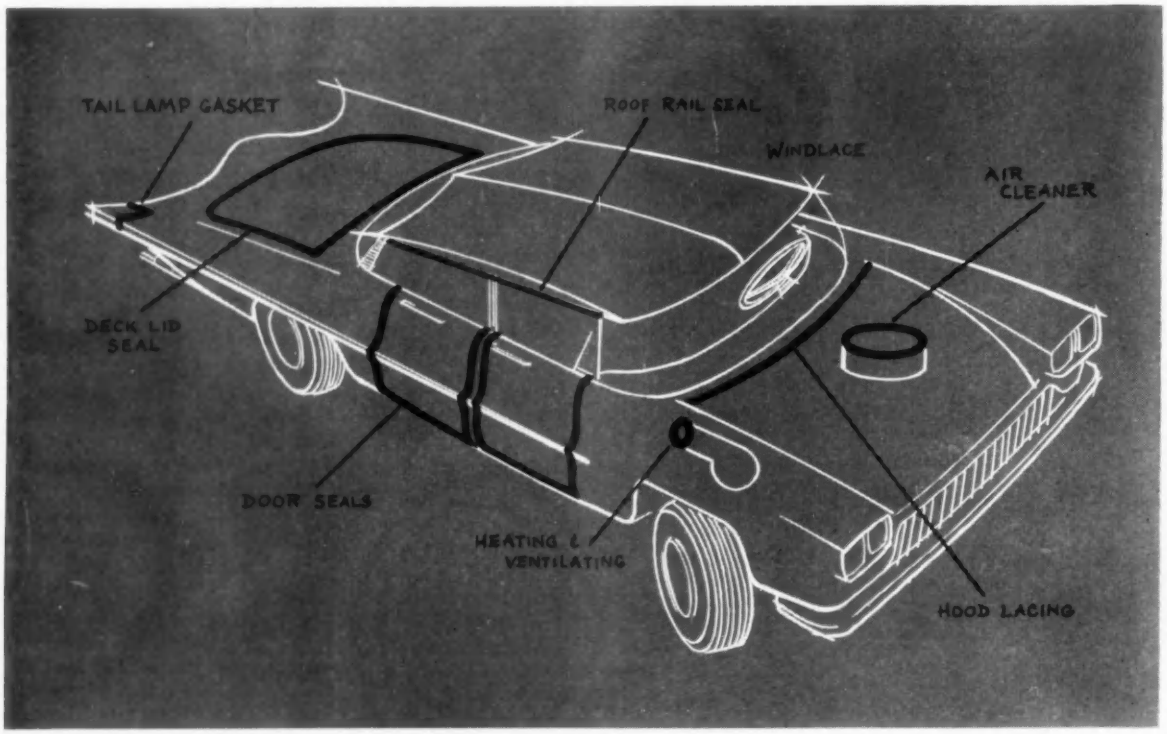
Subsidiary EATON Manufacturing Company

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla. Automotive Products Company, Ltd., Brock House, Langham Street, London W.1, England, European Representative

Circle 131 on Inquiry Card, for more data

A new and improved body seal: extruded closed cell neoprene

New approaches to body sealing and gasketing are possible with extruded closed cell neoprene. It can be extruded into low-pressure body seals of controlled softness that are weather and ozone resistant, and have low water absorption. The "self-skin" of these extrusions and the closed cell structure beneath removes the need for a protective coating. Tighter radii can be turned without wrinkling, providing an effective seal. For more information write for your copy of EXTRUDED CLOSED CELL NEOPRENE SPONGE. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. AI-5, Wilmington 98, Delaware.



Applications of extruded closed cell neoprene.

Complex cross sections can be extruded.

DU PONT

Better Things for Better Living . . . *through Chemistry*

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON®
ADIPRENE®

Circle 132 on Inquiry Card, for more data

News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 120, No. 10 **May 15, 1959**

Industry Spokesmen Protest Price-Supervising Legislation

Price-supervising legislation, up for an airing before a Senate group, is strongly protested by automobile and steel industry spokesmen.

Public hearings on S. 215, a bill to force notification to the government of proposed price hikes, were started late in April. The Senate anti-monopoly subcommittee, conducting the hearings, views the measure as applicable only to the pricing policies of large concerns.

A 30-day notice of a plan to raise prices would have to be given to the government, in writing. Federal Trade Commission and the U. S. Justice Dept. could require the company concerned to document and to defend, at a public hearing, its reasons for seeking higher prices.

This interjection of government activity into industrial pricing plans is seen by major industry executives as an unwise move. Board Chairman F. G. Donner, of General Motors, identifies S. 215 as a forerunner of government pricemaking controls.

In a telegram to the subcommittee, Mr. Donner observes that the bill, as written, would reach into broad areas of industry—and not touch merely the corporate giants. Consumers would be importantly affected, he says, as would the producers and sellers.

Board Chairman Roger M. Blough, U. S. Steel Corp., also has told the subcommittee of his firm objections to the bill. He challenges the attitude that it would apply only to huge corporations. Using a report by the Senate group, he finds that, in 58 per cent of American industries and subindustries, eight or fewer companies account for 50 per cent or more of the total sales. Thus, S. 215 might be made to apply to a great many industries, nonbasic in nature, he holds.

Mr. Blough suggests that if the subcommittee is worried about administered prices it should consider labor and government costs. Since 1940, he says, prices of manufactured items have gone up by 112 per cent. But the administered price—or cost—of hourly labor has risen by 222 per cent, and government costs are up more than 400 per cent.

RILEY 4/ SIXTY EIGHT HAS FARINA STYLING

Latest British Motor Corp. model to use the basic Italian designed Farina body is the Riley 4/Sixty Eight. Car is powered by a sports-tuned twin S. U. carburetor version of the 90.88-cu in. four-cylinder engine, which delivers a maximum of 68 bhp at 5400 rpm. Among interior refinements are leather upholstery, and burr walnut veneer dashboard and door trims.

Dodge Enters Diesel Field With Cummins-Powered Trucks

Dodge Div. entered the Diesel truck field with the early unveiling of a 1960 Cummins-powered tandem tractor. The truck, equipped with the Cummins NH-220, is the first of four Dodge Diesel trucks for 1960 that will go on sale next fall.

Dodge put its new unit on display May 14 at the International Petroleum Exposition in Tulsa, Okla.

M. C. Patterson, division general manager, says the new truck with the NH-220 will offer a maximum gcw of 76,800 lb, 15 per cent higher than current Dodge models.

In the fall, new Dodge trucks with Diesel power will range from 27,000 to 53,000 lb gvw and from 50,000 to 76,800 gcw. The later models will use Cummins' new lightweight C-175 Turbo-diesel, the NH-180 and the NH-195.

Patterson says the addition of Diesel power to the Dodge truck line opens an entirely new area to Dodge, especially west of the Mississippi River. The big rig, he says, will haul virtually any product and commodity in over-the-road operations in the highly dieselized Western states.

NEWS AUTOMOTIVE AND AVIATION

WIRING HARNESS

Wiring harness for a passenger car is undergoing a 67-point electronic test at M-E-L Quality Control Center, at Wayne, Mich. Each check point is numbered to correspond with numbers on dial of electronic checker at right. A faulty wire or connection will stop the dial indicator.

Automatic Trucks Speed Distribution of Parts

A long line of 700 automatic trucks, speeds and simplifies handling of service parts at Chevrolet's million sq ft National Parts Distribution Center near Flint, Michigan.

The continuous conveyor system, called Towveyor, delivers the unmanned trucks to any of the shipping or receiving docks, storage bins, packaging and painting areas, or virtually anywhere else in the warehouse. A pick-up dog on the moving underfloor tow chain engages the connecting pin at the front of a truck, disengages when the truck reaches its predetermined destination.

A sensitive front bumper disengages the connecting pin if the truck makes contact with another stopped truck, and the pin re-engages automatically when bumper pressure is relieved.

Operating Details

To start a truck on its trip, an operator sets an electronic switch on the front of the truck. With various dial settings, it is possible to send a truck anywhere in the warehouse, pre-selecting the proper main loop, side spur and stopping point.

Towveyor covers 9250 feet with four main loops, 13 spur lines, eight transfer stations, and a weighing station. The main line, moving at about 100 ft per minute, has pick-up dogs spaced every 24 ft. The spur and transfer lines, moving at 78-85 ft per minute, space the trucks every eight ft. Trucks have a usable capacity of 2000 lb.

7 Million Parts Processed

Thus, Chevrolet processes more than seven million parts, weighing about 250 million lb, each year at its distribution center. Inventories cover more than 57,000 parts for Chevrolet, Pontiac, Oldsmobile and Vauxhall, dating back to 1935.

The master depot serves 41 warehouses in the U. S., 19 overseas plants and 130 independent foreign distributors of GM parts. Chevrolet uses similar, although smaller, Towveyor systems in its Atlanta and St. Louis supply depots.

One Towveyor (made by Jervis B. Webb Co.) is installed at Detroit Diesel Div. All other Towveyor systems are in non-automotive warehouses.

Expansion South of the Border Is Planned by Chrysler Corp.

Further Latin American expansion programs have been mapped by Chrysler International to cash in on a predicted market boom in Spanish-speaking countries south of the border.

In Mexico, plans are under way to assemble Simca automobiles in the assembly plant of Fabricas Auto Mex, Chrysler fabricant and distributor since 1938. Eventually, Auto Mex also may assemble Simca trucks and tractors as well as a U.S.-designed truck.

And in Argentina, Chrysler is proposing a $15 million investment with Fevre y Basset for a truck manufacturing operation. Fevre y Basset has been assembling Chrysler cars and trucks in its 500,000 sq ft plant since 1950, has been distributing Dodge vehicles since 1916.

The Mexican plan calls for immediate conversion of the Auto Mex assembly, trim, and chassis lines to accommodate Simca vehicles as well as Chrysler products. A special study group will check into the possibility of producing engines, transmissions, rear axles and other major parts in Mexico. Currently, Auto Mex assembles the Chrysler cars with parts shipped from the U. S.

Fevre y Basset also uses U. S.-built components for its vehicle assembly. But, within four years, some 70 per cent of the truck parts and components used will be built in the Argentine.

Chrysler will provide working capital, machinery, equipment, tools, dies and technical assistance to get the Argentine truck manufacturing program under way as soon as possible. The plant will be expanded and floor space added, according to plans.

Goodyear Builds Biggest Tire But Has No Place to Put It

Goodyear Tire & Rubber Co. has built the world's biggest tire—a two-ton giant with a $14,000 price tag—but so far, there is no vehicle big enough to use the monster.

The tire, which stands 10 ft high and measures four ft across, is a research model for earthmoving and construction machines still in design stages. With the huge 44.5—45 tires at 32 ply rating, a vehicle could carry more than 30 tons at 30 mph on only 35 lb air pressure. The same tire, at 50 ply rating, could carry a 40-ton payload at more than 50 mph.

The tire was built on a machine that sprawls over 4500 sq ft of floor space in Goodyear's Akron Plant. The machine, plus the 60 ton vulcanizing mold, cost $250,000.

Body Engineers Plan Three-Day Meeting for October in Detroit

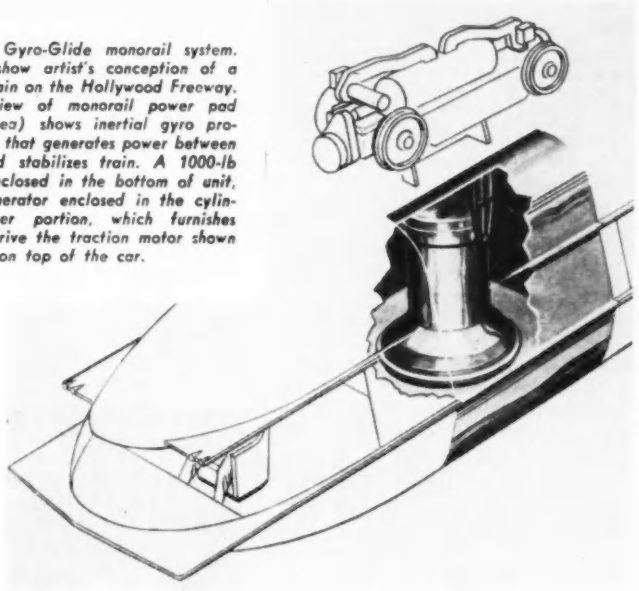
The American Society of Body Engineers is scheduling its 14th annual technical convention for Oct. 21-23 at the Rackham Memorial Building, Detroit. Sidney A. Nash of Ford Motor Co., convention chairman, says more than 50 exhibits are being planned.

EXECUTIVES READ
AUTOMOTIVE INDUSTRIES

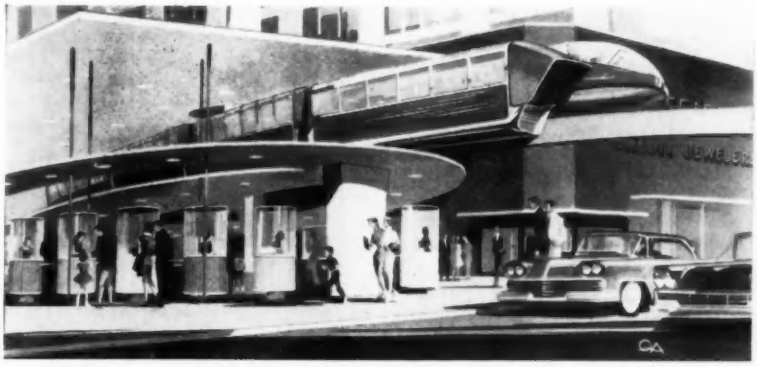
City Planners Eye Monorail Transit Systems As Cure for Traffic Headaches

City planners are eyeing a new development in mass transportation—monorail transit systems—as a cure for urban traffic headaches.

The city of Seattle took a big step in this direction recently when it named Lockheed Aircraft Corp. prime contractor to build a monorail system for the city's Century 21 Exposition—the first such system within a city. The exposition opens May 10, 1961 on a 74-acre site about a mile from the heart of Seattle's city center.



Northrop's Gyro-Glide monorail system. Top view show artist's conception of a monorail train on the Hollywood Freeway. Cutaway view of monorail power pad (shaded area) shows inertial gyro propulsion unit that generates power between stations and stabilizes train. A 1000-lb flywheel, enclosed in the bottom of unit, turns a generator enclosed in the cylindrical upper portion, which furnishes power to drive the traction motor shown on top of the car.



Artist's sketch shows downtown terminal for Seattle monorail system. Each car carries 24 persons and is designed so that entire side slides upward for easy entry and exit.

System Costs $5 Million

The complete monorail system will cost about $5 million and include three "airtrains," supporting structures, and terminals.

Lockheed expects to have the system in operation by November 1960, six months before the exposition opens, according to Lockheed senior vice-president Cyril Chappellet.

Chappellet said the airtrains will whisk passengers from near downtown Seattle to the exposition grounds overlooking Puget Sound in 94 seconds. Top speed of the airtrains will be 60 mph.

Chappellet said the Lockheed design calls for "supported" type trains mounted atop the rail in contrast to the "suspended" or "hanging" type, which dangle from overhead suspension systems.

Lockheed's design also provides automatic block controls, automatic speed and braking controls, radiant heating, and built-in public address units.

Northrop Submits Proposal

Meanwhile, in Los Angeles, city planners were studying a design proposal for a monorail system submitted by still another aircraft manufacturer, Northrop Corp.

Company officials said the Northrop design—called Gyro-Glide—features a unique propulsion unit that eliminates the need for a trolley or third rail between stations.

Heart of the unit, Northrop says, is a 1000-lb inertial flywheel, which is set in motion by a station power source. The flywheel whirls at high speed, turning a generator, which provides current for the traction motors between stops.

Flywheel Acts as Gyroscope

On long runs, the flywheel can pick up new energy from sections of powered rail along the route without stopping. While the train is in motion, the flywheel also acts as a gyroscope to resist swaying.

Weight of a four-car Gyro-Glide train is about 114,000 lb fully loaded—about one-fourth the weight of conventional trains.

Northrop officials said the overhead track and support structure would cost between $1 and $2 million per mile, depending upon location of routes and number of station platforms. Cars would cost about $100,000 apiece when ordered in quantity.

NEWS AUTOMOTIVE AND AVIATION

MACK UNVEILS NEW DIESEL TRUCK SERIES

Mack Trucks, Inc., is producing a new G model tractor that can be fitted with a wide variety of Diesel engines to pull medium as well as the heaviest loads at highway traffic speeds. The G series is available in 8 different four- and six-wheel models, and can be used as straight trucks or as tractors with a combination of full or semitrailers.

All Five Automobile Companies Report Sales, Earnings Gains

There is no doubt about it: the recession is over in the automobile industry. Sales and earnings figures from all five automobile manufacturers for the first quarter of 1959 prove that. Toss in the encouraging production figures for April—healthy increases in every case—just for good measure.

The automobile industry was perhaps the hardest hit by the recent recession. But the industry has been traveling at a good pace since the model year began. There were skeptics, it's true, who warned of a slowdown when the first glow had worn off the new cars and dealer stocks were replenished, but it failed to materialize, as the following items show:

Ford Motor Company production for April was more than double a year ago, with every car line up substantially.

Studebaker-Packard Corp. reported a $7.7 million profit for the first quarter, highest in the corporation's history.

American Motors increased production schedules for the balance of the model year by another 10 per cent—the 10th scheduled increase since 1959 production began.

Chrysler Corp., despite the hampering strikes earlier in the year, has boosted its production, its sales and its earnings during the first part of 1959.

Here is a summary of the first quarter:

American Motors: First quarter sales of $228.7 million, compared with $193.7 million the previous quarter and $108.7 million a year ago. Earnings of $12.4 million (after taxes of $15.6 million), compared with $21.1 million the previous quarter (no tax paid) and $2.3 million a year ago. April production of 40,235 cars, compared with 14,349 in 1958.

Chrysler Corp: Dollar sales totaling $691 million, up 29 per cent from year ago. Earnings of $15.2 million for the period compare with net loss of $15.1 million last year. Unit sales of 218,114 cars and trucks well above last year's 185,888. Defense business up $30 million. Production in April totaled 99,065 passenger cars, nearly double last year's 51,863 cars. Four-month total of 306,840 cars and trucks topped 1958 by 78,700.

Ford Motor Co.: Sales totaled $1475.3 million, earnings $134.8 million, and four-month production amounted to 740,019 cars and trucks. Comparable figures for a year ago were $1095.8 million, $29.8 million and 495,914. April production included 140,662 Ford passenger cars, compared with 69,314 last year, for company total of 160,576 cars and 30,919 trucks.

General Motors: First period sales, $3206 million, up $485 million, earnings, $293 million, up $108 million; unit production through April, 1,241,507 vehicles, up 258,037 units. April production included 264,146 cars and 46,727 trucks, compared with 166,782 cars and 31,446 trucks and buses in 1958.

Studebaker-Packard Corp.: Net earnings of $7.7 million in the first quarter, up 110.7 per cent from the previous quarter. Sales of $115.4 million during the period, up from $88.6 million the preceding period. Working capital during the period increased from $44.8 million to $55.1 million. April output totaled 14,803 cars and 833 trucks, compared with last year's 3373 cars and 630 trucks the same month. The four-month total for 1959 was 54,431 vehicles; last year it was 11,257 units.

Gordon Foresees Annual Sales Of 7¼ Million Cars by 1965

The automobile industry can expect a normal annual sales level of 7¼ million passenger cars by 1965, according to General Motors president John F. Gordon.

He bases his prediction on an anticipated average sales increase of three per cent a year during the next five years. Total U. S. population is expected to reach 190 million by 1965, with a 30 per cent increase in the number of families with annual incomes of $7500 or more.

During that period, says Gordon, the number of families owning more than one car will rise by more than one-third.

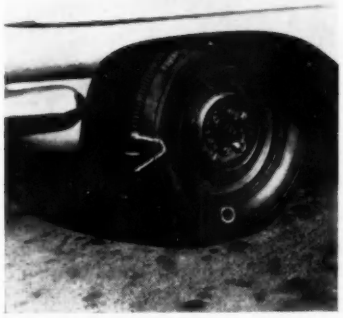
Oldsmobile Now In Production On Semi-Closed Air Suspension

Oldsmobile is producing a new semi-closed Neu-Matic Ride air suspension system. It dropped its closed system after the model '58 year.

The simplified 1959 system has only one air storage tank—the low pressure tank formerly used has been eliminated. The current Neu-Matic also has a new cooler running compressor (160 psi) and a new system fluid. Stronger diaphragms—50 per cent natural rubber and 50 per cent synthetic—also are used.

Air from the suspension bags is exhausted directly back to the compressor and reused, if needed; otherwise it is expelled to the atmosphere. All new air is cleaned first by the engine air filter, then by a secondary filter.

The 1959 system includes the hand operated four in. elevator valve and three automatic height control valves. Metal baffles protect the air lines running below the under body.



EXPERIMENTAL AIRLESS TIRE

This mutilated tire may open new horizons for the automotive industry, according to Dayton Rubber Co. Filled with urethane plastic foam, called Polyrubber, a set of tires was subjected to punishment from small arms fire, buzz saws and electric drills. Regardless of the amount of damage in the casing or tread, the material retained its "foamed in place" position and continued to provide normal support during the rugged road tests that followed.

New Willys Station Wagon Features Two-Wheel Drive

Willys Motors, out of the domestic passenger car field for several years, is making a minor effort to re-enter the market with a new offering. Willys has introduced a six-passenger, two-wheel-drive station wagon priced at $1995, fob Toledo.

The "Jeep" wagon is powered by Willy's four-cylinder F-head "Hurricane" engine. It is built on a 104.5 in. wheelbase with a 176 in. overall length. Rear seats fold forward to provide 100 cu ft of cargo space.

Eight two-tone color combinations, vinyl-coated interior fabrics and Pompano carpeting give the new wagon more of a "family car" appearance. It also features a new one-piece windshield and a lower, ribbed roof panel.

New Power Trunk Release Operates from Driver's Seat

Oldsmobile has introduced a power trunk release mechanism that operates from the driver's seat. The vacuum-actuated system makes it possible to unlock and open the trunk without getting out of the car or using the key.

The Olds option releases the trunk lock with a vacuum flow, and the lid torque rods lift the trunk lid automatically. The release handle is located inside the glove compartment box.

A vacuum reserve tank near the engine provides power when the engine is not in operation. The trunk also can be unlocked with the key, if desired.

(*Turn to page* 47, *please*)

AI TABLOID

Allegheny Ludlum Steel Corp. is working together with a number of muffler manufacturers to develop a new design for a muffler made of stainless steel which will last the life of a car. Three types of stainless—430, 304, and 310—were tested by partially immersing them for about 600 hours in a beaker of boiling engine condensates inside a chamber held at 200 F. None of the steels showed any signs of either liquid or vapor phase corrosion, according to Allegheny.

* * *

Results of a three-year corrosion tests program on 4300 specimens of metallized coatings at 8 test sites are available from American Welding Society. Aim of the tests was to determine the life of coatings in each environment, the effect of various methods of preparation of the steel, and the increase in life of the zinc and aluminum coatings when seal coatings were added. For copies of the complete report, send 50¢ to AWS, Dept. T., 33 West 39th St. New York 18, N. Y.

* * *

A 920-page monograph by a leading Russian scientist on the chemistry and uses of organosilicon compounds has been published in English by the Air Force. The study covers such topics as methods of preparation of both monomeric and high-polymer organosilicons and their uses in electrical materials, metal coatings, lubricants and hydraulic fluids, plastics, and precision coatings.

* * *

American Potash & Chemical Corp. announced it has synthesized a new type of molecule that may lead to the development of plastics that can withstand temperatures as high as 750 F. The new compounds—based on boron and phosphorus and known chemically as phosphinborines—consist of two basic types — one heat resistant but brittle, the other having plasticity but lacking heat stability. More research is needed to combine the desirable properties—plasticity and heat stability—into a commercially suitable product, American Potash says.

A new low-cost transistorized radio for cars designed around five special transistors has been developed by Radio Corp. of America. According to RCA, the new ultra-compact radio reduces battery drain; requires no "warm-up" time; is impervious to damage from normal shock and vibration; and can operate on either six- or twelve-volt systems, negative or positive ground, with only a slight change in circuitry.

* * *

National Bureau of Standards designed a simple rotating molecular still that can be used to study petroleum byproducts by a distillation technique. The new still separates and purifies test samples of high-boiling point materials rapidly and efficiently without exposing them to damage from high-operating temperatures, NBS says.

* * *

Two new stainless steels designed for nuclear applications are now available from Universal-Cyclops Steel Corp. One is a low, low cobalt stainless (about 0.002 per cent cobalt, or less than 20 parts per million) used for containers and internal structural members in atomic reactors. The other is a high boron material for reactor shielding and control rods developed as a substitute for hafnium, a short supply metal.

* * *

A new group of 18-8 type stainless alloys containing molybdenum has been developed by Cooper Alloy Corp. Designated PH55, the new alloys operate in the 1000-1400 F temperature range and are stronger than existing precipitation alloys of the corrosion resistant type, according to Cooper.

* * *

Chain Belt Co. has been licensed by a German firm to assemble and sell in this country a universal joint said to have features not found in American-made universals. The joints have a tubular telescoping drive shaft with an overload clutch and safety guard. They are made of cold drawn lightweight tubing and are designed for use in agricultural machinery.

AVIATION MANUFACTURING

MODIFIED C-130 MAKES FIRST DELIVERY TESTS

This modified Lockheed C-130 successfully tested its ability to take-off with two jet drones nestled under its wings. Total take-off weight including 2 one-ton drones was 100,000 lb. Pylons for two additional drones can be seen under outer wings. The plane, called the Drone Launcher/Director GC-130A, is one of two C-130A Hercules propjets being modified at Lockheed's Marietta, Ga., facility for the Air Force Air Research and Development Command.

McElroy's Dilemma: What Do You Do With Too Much Money?

Defense Secretary McElroy is considering what to do in case the Congress votes more funds for intercontinental missiles than he asked.

The Air Force, responsible for the ICBM programs, has asked $2.6 billion for missiles in the year beginning July 1. This sum is not broken down to show the amount for the long-range missiles. But it is evident now that a strong effort will be made in Congress to tack on more ICBM money as part of the approved budget.

Rep. Mahon, D., Tex., indicates he is dissatisfied with the amount of ICBM money requested. As chairman of a defense appropriations subcommittee in the House, he is in position to drum up support for the voting of more money than was asked.

Secretary McElroy is well aware that the military services may be granted more money than they called for. In 1958, Congress voted additional funds for such weapons as the Polaris IRBM and the Minuteman ICBM. Some of the money approved in 1958 is still held up by the Pentagon, for possible use in the coming year.

Mr. McElroy declared in mid-April that his office had no current plans for accelerating the Atlas ICBM program further. This missile, tested with considerable success, is seen in some quarters as ready for much heavier financial backing to speed its production.

The Pentagon chief admitted, however, that his office is studying possible accelerations of many programs on a just-in-case basis. He conceded that his officials must keep up a constant review of these programs, in the event that new intelligence estimates or a failure in a current program may require a change in emphasis.

Mr. McElroy believes that if Congress votes an over-all defense budget of more than the requested $40.9 billion, President Eisenhower probably will go along with it. But the Defense Dept., with White House approval, may hold back on the spending of unasked-funds, on the grounds that they are not now needed.

Recently, the Defense Dept. called attention to its action on the extra money approved last year for the solid-propellant Minuteman. An extra amount of $90 million was voted, and the Pentagon says an equal sum was spent on the development of this missile. But the money spent came from savings in other programs, according to the Pentagon.

These savings, in the Defense Dept. view, mean that money which could have been spent this year on the Minuteman will be available for spending in the new year. The policy of holding back unasked money for a succeeding year may be extended by the department to any added ICBM money it gets this year.

Fewer But Better Contractors Predicted by Missile Expert

A leading government executive on missiles predicts flatly the Pentagon will be doing business with fewer but better missile contractors before long.

Brig. Gen. Austin W. Betts, executive assistant for missiles to Defense Secretary McElroy, likens the existing pattern in missile manufacturing to that in automotive manufacturing 40 years ago.

"The reason there are only some six or seven major automobile producers in the country today is that in this highly competitive business only that many were able to survive," Gen. Betts points out. "They found that by integrating development and production capabilities, they were able to compete more effectively.

"Forty years ago, there were literally dozens of companies making automobiles. Now it is a handful.

"I think we must look forward to the same ultimate future in the business of the guided missile program. With fewer systems, we will need fewer development teams. With more complexity, each team will have to be technically more versatile.

"At the same time, we will need strong support of a broad research and component development program to assure continuing advances in technology across the board.

"We must learn to support this type of effort (research) even when specific applications are not immediately apparent. Only in that manner will we be able to take long steps forward when we decide to produce

a new missile or other weapon system."

The weeding-out process among missile contractors will not be due entirely to the coming efficiency contest. It will result also from Pentagon decisions to drop marginal and obsolete weapons.

"We are going to have to support fewer and better new systems," Gen. Betts declares, "which in turn is going to mean that there will be fewer producers.

"And this is of necessity," he comments.

Republic Capsule Ejects Pilot In 2 Seconds from Mach 3 Plane

Republic Aviation Corp. has developed a rocket-propelled capsule that ejects a pilot from a supersonic plane within two seconds after an emergency occurs.

The capsule functions as a seat during normal flight. In an emergency, it automatically closes around the pilot to form a protective cocoon. Then it is shot out of the plane along a short set of rails.

The new capsule is designed primarily for the new generation of Mach 2 and Mach 3 aircraft, according to Bert Cooper, Republic escape systems engineer and Arnold Beck, human factor design specialist. It is also expected to solve some of the problems encountered in bailing out of space vehicles, they said.

The capsule works this way:

To eject, the pilot pulls a handle. In split-second succession, restraining devices pull his feet and legs back into ejection position; his shoulder and body harness is locked, his crash helmet is clasped to prevent twisting; his body is also locked to prevent damage to the spinal column.

Simultaneously, the bottom of the capsule-like seat arises and sliding doors and top enclose the pilot.

The canopy or hatch is catapulted clear by two rocket charges at a speed of 65 to 70 ft a second. The system provides a parachute to assure a soft landing and a flotation gear in case of landing in water.

British Planning to Build 100-Passenger "Hovercraft"

Britain's first man-carrying "hovercraft", the saucer-shaped S.R.N1, is supported by a cushion of air and skims at 3 ft above the sea or flat ground at speeds up to 40 mph.

The prototype (*see illustration*) carries a two-man crew, is 30 ft long, 24 ft wide, weighs 2 tons. It is powered by a vertically mounted 450-hp aircraft engine that drives a ducted fan to provide the supply of air for lift and propulsion.

The craft is being made by Saunders-Roe under contract to the National Research Development Corp. First tethered trials are slated for June.

After further tests and development, plans are to build a 100 passenger machine with the impeller driven by a Rolls-Royce Dart turboprop. Studies so far carried out indicate the possibility of multi-engined machines weighing up to 10,000 tons.

Such machines would carry 1000 passengers and 100 cars and "fly" at 10-15 ft at speeds of 100 mph. They would be most suitable as ferries across the English channel, since hovercraft require a fairly level reactive surface such as sea or beach.

NASA to Get $45 Million More To Carry Out Space Projects

Space scientists in the government are virtually assured of winding up the Federal fiscal year on June 30 without going broke.

A White House request for another $45 million to help the National Aeronautics and Space Administration pay for planned projects has gone to Capitol Hill. Approval by Congress is considered certain, inasmuch as the Senate and House have agreed on the need for these funds. An authorization bill, S. 1096, was passed by both bodies.

Intended uses of the new funds include $20.75 million for Project Mercury (manned space flight) and $24.25 million for construction, equipment, and facilities. In the latter sum will be $9 million for expansion of the Jet Propulsion Laboratory, Pasadena, Calif. In addition, new satellite tracking stations will be built, as will facilities to develop a single-chamber rocket engine with a thrust of 1 million pounds or more.

Ford Gets $23 Million Order For Shillelagh Development

Ford Motor Company's subsidiary, Aeronutronic Systems, Inc., has received a $23 million Army contract for development of the new Shillelagh surface-to-surface missile. The lightweight troop support and anti-tank missile will be developed by Aeronutronic's Tactical Weapon Systems Div. at Maywood, Calif. for the Ordnance Tank Automotive Command at Detroit.

The contract is Ford's first major missile order and the first sizeable defense order for the company since the aircraft engine plant in Chicago was closed last year. It is also said to be the first missile development contract awarded to an automobile company.

Other contracts in the automobile industry have been for missile production (Chrysler's Jupiter, Redstone) or for component development (AC Spark Plug's inertial guidance system).

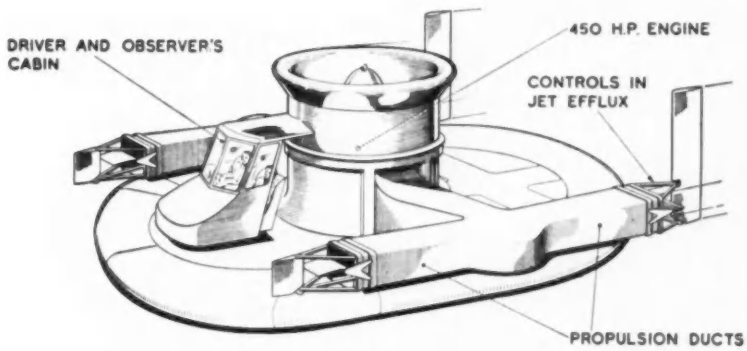
Aeronutronic president Gerald J. Lynch says Raytheon Manufacturing Co. has been named subcontractor on fire-control sub-system development for the Shillelagh.

Bendix Gets $41 Million Award To Build Talos Guided Missiles

The Navy awarded contracts totaling $41 million to Bendix Aviation Corp. for work on Talos guided missiles.

One contract, for about $28.3 million, is for production of Talos guided missiles. Two other contracts, totaling over $12.9 million, are for Talos missile engineering and procurement of prototype missiles. Work will be done at an ordnance plant at Mishawaka, Ind., which Bendix Products Div. operates for the Navy.

Talos is the Navy's longest-range surface-to-air weapon.



Prototype of Saunders-Roe hovercraft carries two-man crew

MEN IN THE NEWS

Electric Auto-Lite Co.—Edwin R. Stroh was made vice-president and director of sales.

Babcock & Wilcox Co., Tubular Products Div.—James S. Anderson, vice-president, sales, takes on the additional post of general manager.

Chicago Screw Co.—Paul A. Mongerson was promoted to vice-president.

U. S. Industries, Inc., Clearing Div.—**Vincent J. Mankowski** has been appointed assistant director of research and development.

Gisholt Machine Co.—**Fred L. Chapman** has retired as vice-president, sales, and **Harvey A. Waddell** was elected secretary.

Dow Chemical Co. — **William S. Loose** is now manager of the Metal Sales Dept, and **Donald H. Gilmore** manager of Magnesium Products Sales Dept.

McQuay-Norris Mfg. Co.—**Carl R. Wippern** was elected president; **Ballard A. Yates**, executive vice-president; and **Roger S. Heidenheim**, a vice-president.

Vickers Inc.—**Milton Shapiro** was named manager of the newly formed Market Research Dept.

General Motors Corp., Harrison Radiator Div.—**Lawrence A. Zwicker** succeeded Edward D. Rollert as general manager.

Aluminum Co. of America—**Frank L. Magee**, president, was named chief executive officer; **M. M. Anderson, Leon E. Hickman**, and **Lawrence L. Litchfield, Jr.**, were made executive vice-presidents; and **Theodore W. Bossert** and **Robert A. Learnard** vice-presidents.

Copperweld Steel Co., Superior Steel Div.—**David M. Davis** was appointed sales manager.

Aerojet-General Corp., Systems Div.—**Dr. Robert F. Brodsky** has become manager, engineering services dept., technical staff.

Surface Combustion Corp., Janitrol Aircraft Div.—**Frank H. Scott** was made field sales manager; **Gordon Scholz**, quality control manager; and **Raymond L. Milliron**, chief production engineer, aircraft sheet metals operations.

Warner Electric Brake & Clutch Co.—**Robert A. Heath** has been appointed manager of engineering.

Metal & Thermit Corp.—**Herbert Hirschland** has been elected vice-president of the Commercial Development Div.

Vickers Inc.—**Owen C. Davis** was elected vice-president and treasurer.

Bullard Co. — **Francis L. Dabney** was promoted to executive vice-president.

International Harvester Co., Motor Truck Div.—**Carl A. Lindblom** has been appointed assistant to the vice-president, engineering; **S. G. Johnson**, manager of engineering; and **John H. Letsinger**, assistant manager.

Ford Motor Co., Hardware and Accessories Div.—**Richard T. Thornton** has been named general manufacturing manager.

AP Parts Corp.—**Clifford L. Cope** was elected a vice-president.

Midland Ross Corp., Owosso Div.—**Vince Caponi** has been promoted to sales promotion manager.

Norton Co.—**Peter B. Marshall** has been appointed supervisor of sales training.

General Electric Co., Metallurgical Products Dept. — **Walter R. Ebling** was named market and product analyst.

New Departure Div., General Motors Corp.—**Dr. Richard H. Valentine** was made director of research and development and **Peter Wallack** succeeds him as chief engineer.

Chevrolet Motor Div., General Motors Corp. — L. H. Averill was named assistant general sales manager in charge of the western half of the U. S.

Holley Carburetor Co.—John R. Nyland has been named general sales manager—automotive.

Necrology

Fred E. Reyner, 60, assistant supervisor of the Rocket Div., Bell Aircraft Corp., died Apr. 26.

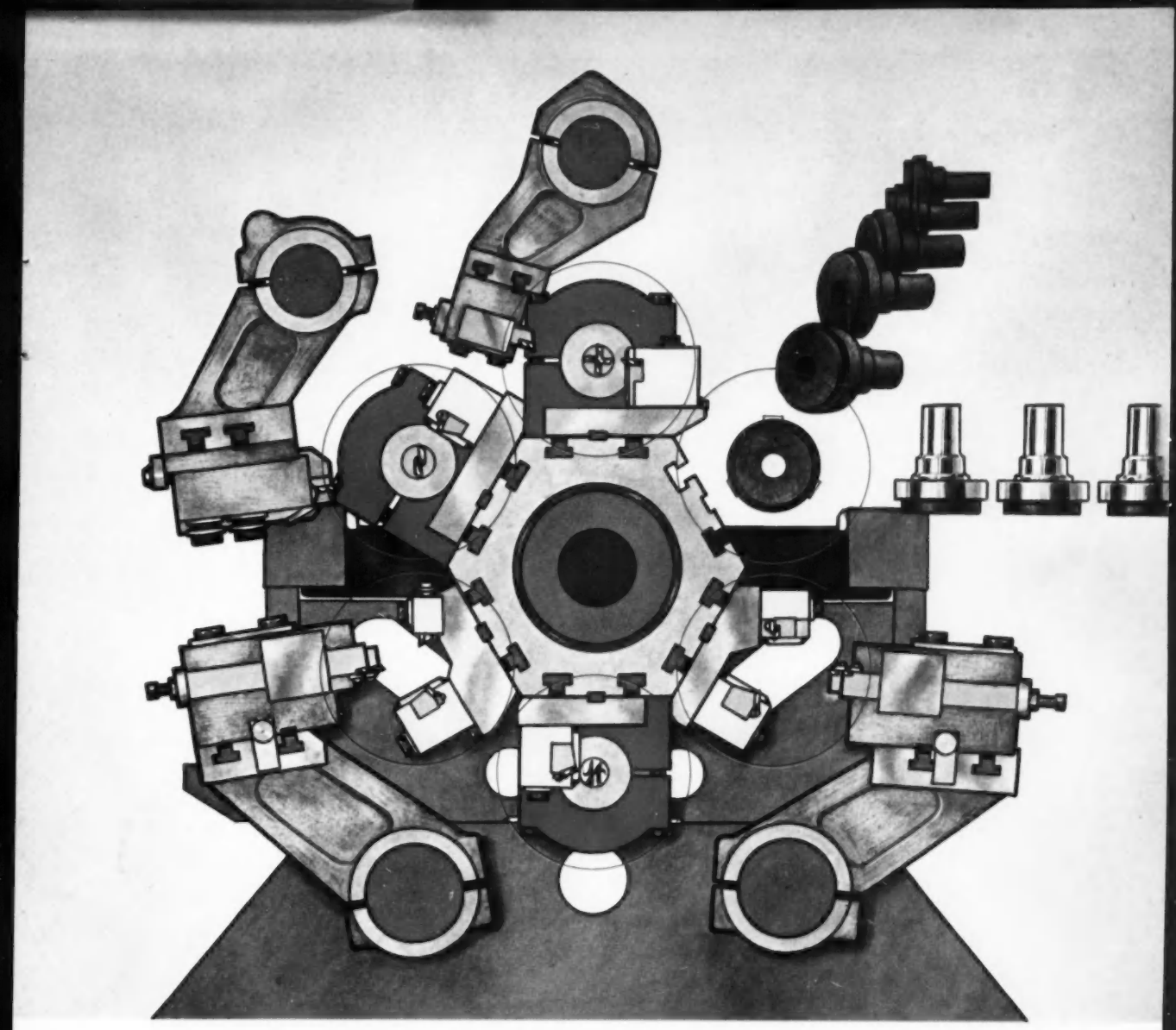
W. F. Harrah, 87, co-founder and honorary chairman of the board of National-Standard Co., died April 16, at Niles, Mich.

Meredith Spear, 51, production manager for the AC Spark Plug Div., General Motors Corp., died April 14, at Milwaukee, Wis.

Glen Crawford, 62, advertising manager for Leece-Neville Co., died April 14, at Pompano Beach, Fla.

Marvin J. Udy, 67, vice president of Strategic-Udy Processes Inc. who developed the first commercial processes for refining chromium, died April 11, at Niagara Falls, N. Y.

Alfred King, 61, distribution manager at the Autocar Div. of White Motor Co., died recently, at Drexel Hill, Pa.



two *approaches to the depreciation problem*

Until there is relief in the form of a more liberal tax depreciation policy, there's only one way to avoid the pinch of a shop full of over-age machines you can't afford to replace: *Buy machines that will stay new.*

If you are a user of New Britain chuckers you have seen their basic principles continue to stand as the most advanced design available, year in and year out.

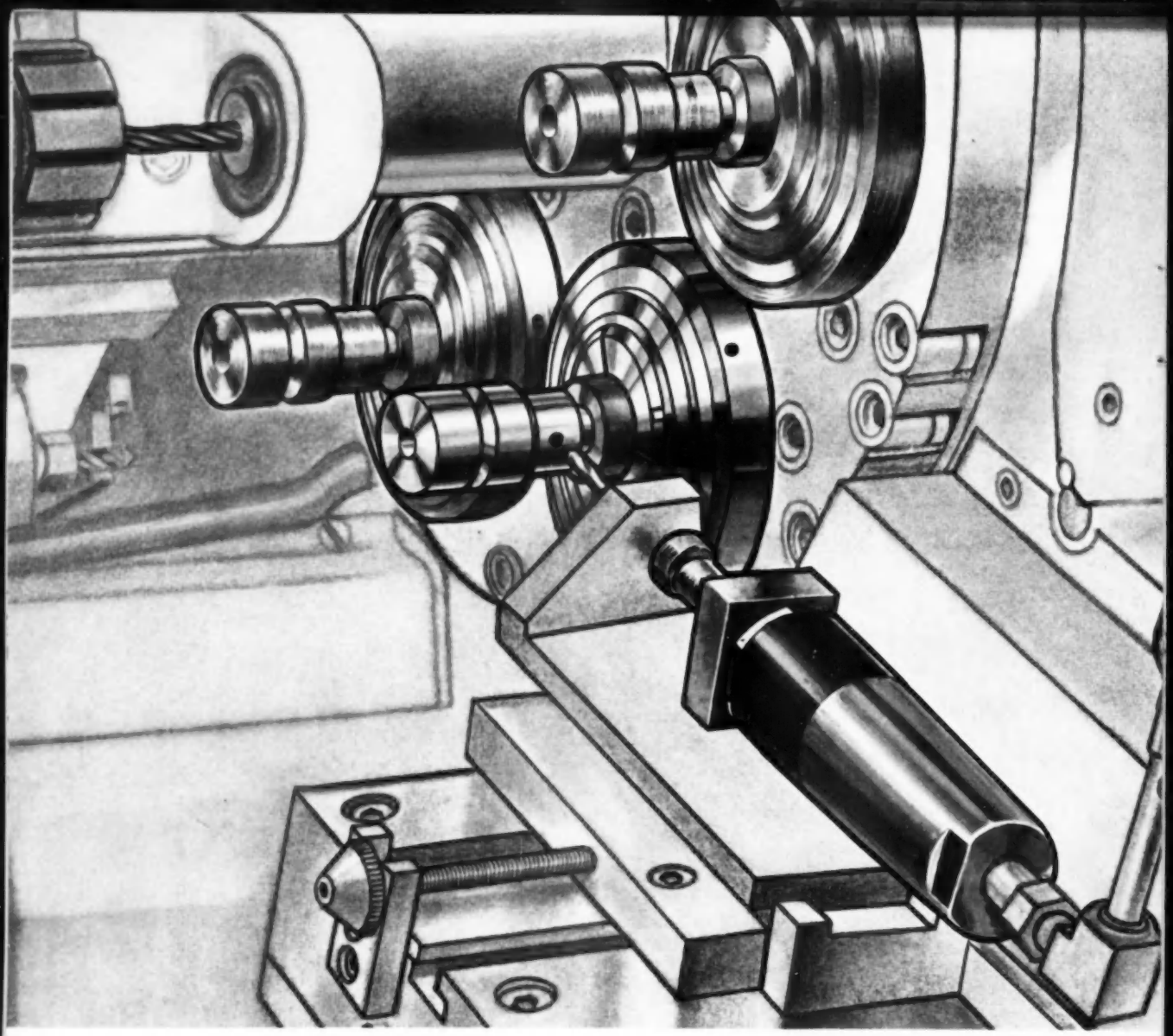
What value do you place on lifetime machine accuracy? The spindle carrier is the heart of a chucking machine. On a New Britain the carrier is lifted during index so it can't wear—then positively clamped to the frame during the cutting cycle for accurate cutting.

Interested in heavy facing and forming cuts? The long established New Britain swinging forming arm feature remains the best answer.

Want maximum clearance for fast and easy tooling, adjustment, and chip removal? Only New Britains are built with open end construction.

Today's New Britain chuckers provide the spindle speeds and power to take advantage of the most modern cutting tools. Optional tooling equipment includes drill speeders and attachments for reversing and non-reversing threading, recessing and accelerated reaming.

A new catalog describes the full New Britain line of 4-, 6- and 8-spindle, open-end, chucking machines. Fully illustrated in color, showing actual jobs, it may well suggest ideas for doing your work. Write for your copy. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



1960 productivity **now**

If you have a voice in the purchase of machine tools you have probably begun to think in terms of what will be on exhibit at next year's Machine Tool Show.

As far as multiple spindle bar work is concerned, you can see and buy and profit from the "show year" developments of New Britains a year ahead of time.

More operations, more pieces per hour, at closer tolerances has been the demand for years. Now New Britain has brought out a complete new line of bar machines that gives these words a brand new meaning.

Take the new Model 45 4-spindle series. The spindle capacity of 5" puts much larger pieces within automatic high-speed bar machine production range. Cross slides in all positions greatly increase the number and variety of cuts possible on four spindles. Spindle speeds up to 526 RPM provide for the use of the latest cutting tools. At the other extreme is a new line of 8-spindle machines. As you would expect with New Britain's radial independent cross slides, you can apply a tremendous number of tools and attachments to get very high production on really complex pieces. Or, with a double indexing set-up, you can turn out pieces, even pretty complex ones, at an all-time high rate per hour.

Six-spindle machines are everybody's work horses and New Britain offers the Model 52 in the 1¼" range, and the Model 62 with 2¼" capacity. These machines allow you to use a greater number and variety of tools on them without sacrificing accessibility. They can be tooled quickly and you can get at the tools for changes or adjustments with ease.

We can only suggest here some of the "show year improvements" in a greatly expanded line of New Britain bar machines. Your New Britain representative will be glad to arrange for a demonstration, and secure performance data based on your prints. If you would like to look over a catalog first, we'll be glad to send you complete descriptive literature. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Conn.

News AUTOMOTIVE AND AVIATION

Continued from page 41

One of the many models in the new Viking-Rapid line, the Camper provides ample sleeping space and large luggage area. Vehicle has overall length of 172 in.

German Firm to Sell New Line Of Vehicles in United States

A new line of German-built semi-commercial vehicles called Viking-Rapid will be distributed in this country by Henney Motor Co., of Canastota, N. Y.

The Viking-Rapid, built by Tempo-Werk, producer of the Matador truck, is available in a wide variety of body styles, including six- and nine-passenger station wagons, pickups, standard and super panels, busses, double cab pickups, and cab and chassis.

The line is powered by the Austin A-35 ohv engine which develops 32 bhp at 4100 rpm. It features a heavy-duty chassis frame of double steel tubular construction braced with electrically welded cross members. Wheel bases range from 106 to 126 in. All vehicles in the line are equipped with front wheel drive.

Port of entry prices, New York, range from $1821 to $2200.

Car Makers Aid U.S. Agency In Auto Exhaust Gas Studies

Cooperation by the automobile manufacturers in current government auto exhaust gas studies is producing favorable comments to Congress.

The U. S. Public Health Service is looking into air pollution from all causes, including exhaust gases. Its research is aided, Surgeon General Leroy Burney tells Congress, by the automobile companies. There have been "concrete cooperative efforts" by government and industry researchers to find how to reduce car exhaust contaminants.

These joint efforts, pursued at government level under a law that is supposed to expire next year, are expected to continue. The automobile and oil industries, the USPHS testifies, are reporting outlays of about $1 million a year for research on air pollution. And the agency is seeking a $200,000 increase in funds for exhaust gas study.

In the fiscal year that ends June 30, the USPHS is spending $4,012,200 for studies into air pollution generally. The budget request for the year starting July 1 is for $4,212,200 for this purpose. This proposed increase is to cover new car exhaust gas research.

These studies are to be of the following types:

1. Weighing of the role of auto exhaust gas in contributing to ill health. Test animals will be exposed to the gases and checked for changes in pulmonary conditions and body tissues.
2. Investigation of phenomena of eye irritation.
3. Development of biological indicators of the intensity of exhaust gas pollution.
4. Examination of the health effects of gasoline additives.
5. Research into the chemistry and control of auto exhausts.

GM of Canada Sets New High In Output for 1st Quarter

General Motors of Canada made more passenger cars in the first three months of 1959 than in any other first quarter in its history, the company announced.

A total of 52,973 passenger cars were built in January, February and March, a 6.7 per cent jump over production of the previous best first quarter in 1955, when 49,660 cars were made.

G.M.'s production of both cars and trucks in the first three months of 1959 increased by 17.1 per cent over the same period last year to 52,973 cars and 9,018 trucks—a total of 61,991 vehicles. This was an increase of 9,074 units over the same period last year and second only to the record 64,803 first-quarter production in 1953.

Truck production increased by nearly 35 per cent from 6,686 in 1958 and passenger car production increased by nearly 15 per cent from 47,230 units in the first quarter of 1958.

S-P Head Sees Trend to More Functional Styling in Cars

G. E. Grundy of Hamilton, president of Studebaker-Packard of Canada, Limited, said in Edmonton "the automobile industry will lead toward functional styling in the future."

"The car industry has gone through the stage of building cars for prestige only. Now functionalism will be the trend in cars and North Americans will get their prestige from swimming pools."

Mr. Grundy was visiting Edmonton during a tour of his company's prairie agencies.

Ford of Canada '59 Sales Hit Record Total in 1st Quarter

Ford Motor Co. of Canada said its Canadian dealers delivered more new cars to customers in the first quarter of 1959 than in any first quarter since 1954.

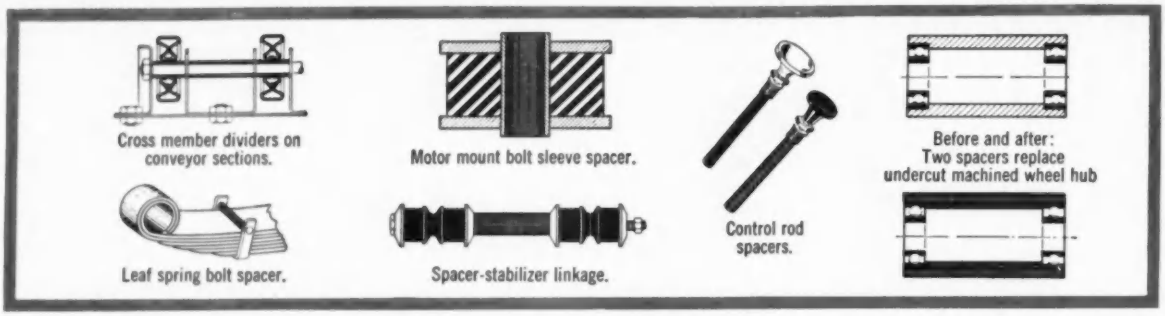
The three-month total of 26,177 cars was 27 per cent higher than the 20,575 cars for the 1958 quarter and up eight per cent over the first three months of 1957.

In March, 1959, sales to customers were one-third more passenger cars and 25 per cent more trucks than in March, 1958.

These results were achieved in the face of the worst winter conditions in years, Rhys M. Sale, president, said. "We are confident we are going to have an excellent second quarter."

The company produced 30,136 cars and trucks in Canadian plants in the first quarter, an increase of 43 per cent over the first quarter of 1958.

F-M Spacers Save Money in Hundreds of Applications. Spacers shown in Red


Cross member dividers on conveyor sections.
Motor mount bolt sleeve spacer.
Control rod spacers.
Before and after: Two spacers replace undercut machined wheel hub
Leaf spring bolt spacer.
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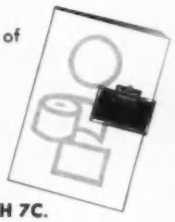

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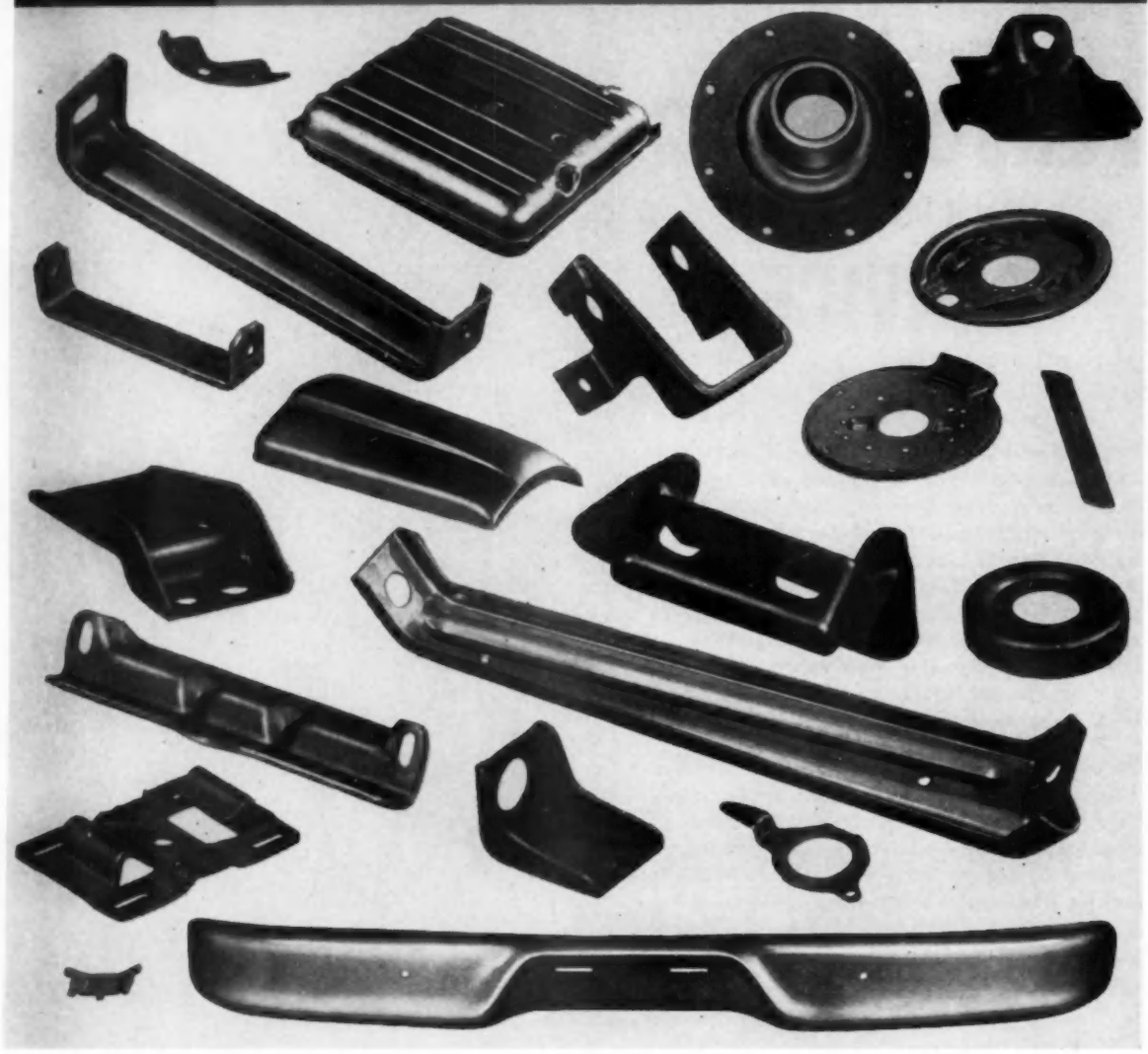

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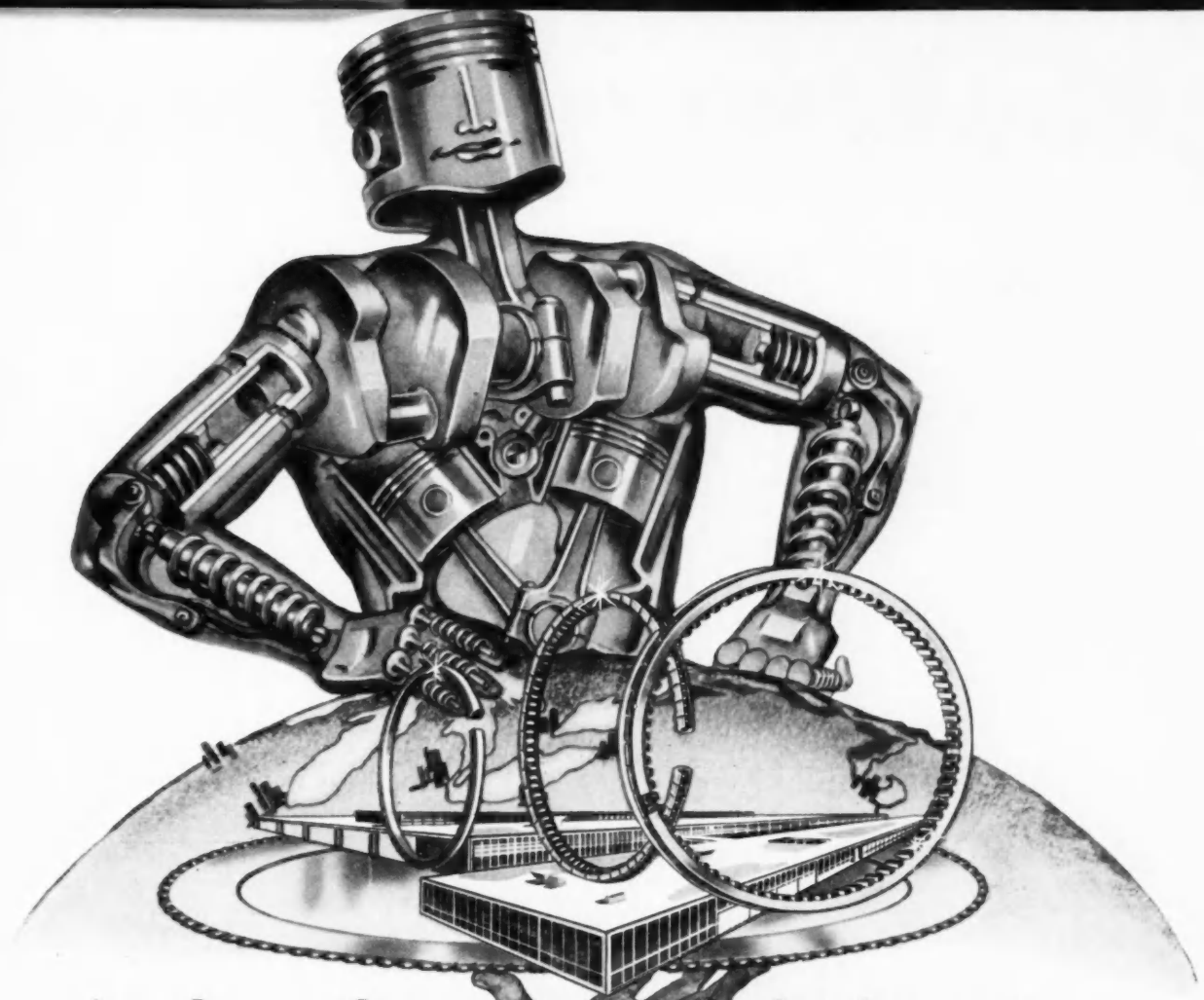

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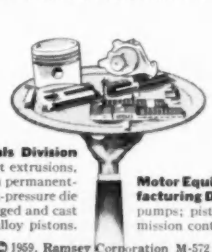

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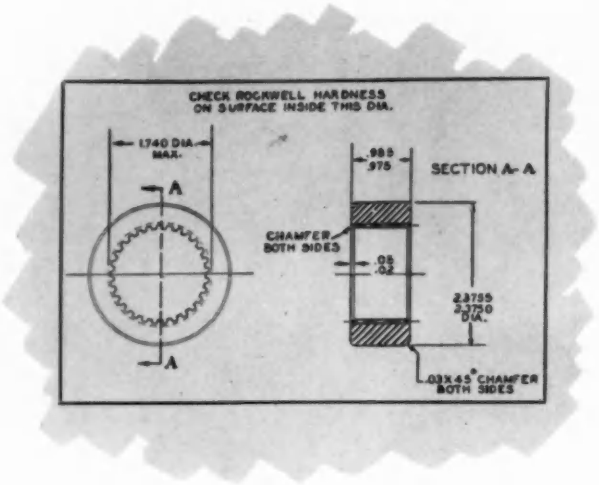
Special Techniques *for Making* Small Components at Ford's Sharonville Plant



Production of the inner race for the converter stator clutch.

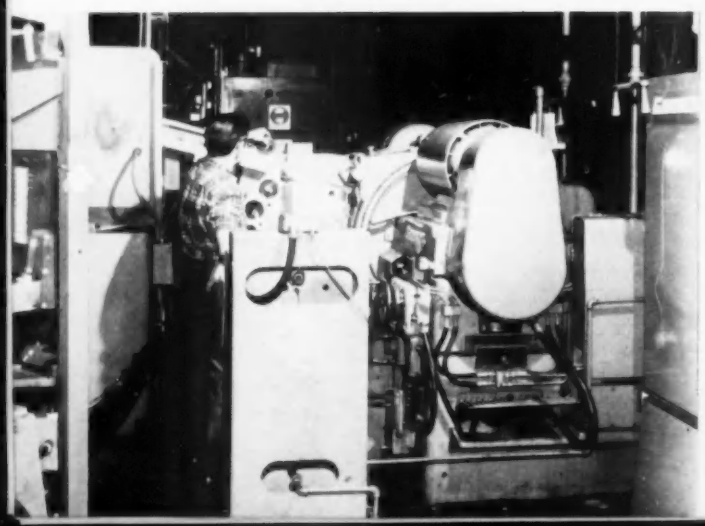
IN the May 1 issue of AUTOMOTIVE INDUSTRIES we presented an introductory article on the Ford Sharonville automatic transmission plant, touching on some of the steps in machining transmission cases and the extension. The present installment is concerned with the special techniques in making smaller components, specifically the inner race and valve body.

INNER RACE

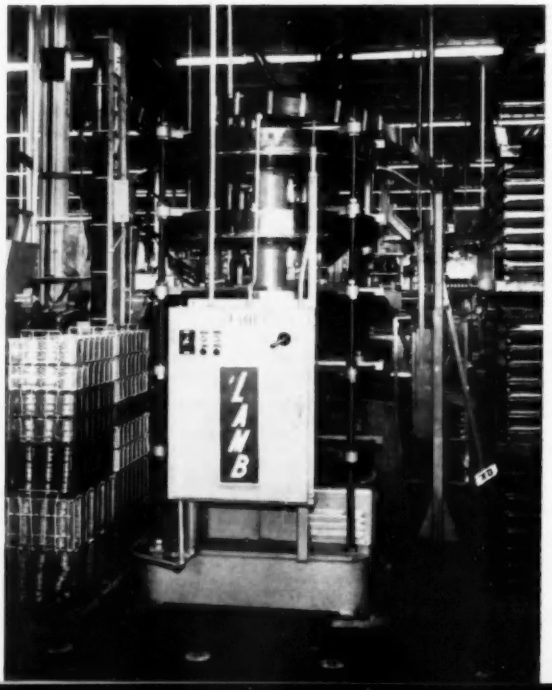
THE inner race for the converter stator clutch was selected particularly because the machine line represents some of the most sophisticated processing and automation devices known to the art. The sequence of operations is continuous and fully automatic, automaticity stemming from the use of integrated material handling systems that count, store, orient, gage, with conveyor transport from one operation to another in cooperation with automatic feeding, loading and unloading devices.

The material handling automation for the inner race (as well as the outer race) represents a new concept developed recently by Jos. Lamb, including extensive use of the Flex-Chute for gravity delivery of parts.

Both inner and outer races are delivered in oriented position to the double-end Gardner grinder shown in this view. One of these grinders is used for semi-finish grinding as the first operation; another Gardner is used for finish-grinding at the end of the cycle. This grinder has a capacity of 900 pieces an hour.



Close-up of one of the newly styled Lamb storage units used in the inner and outer race department. Parts enter the storage unit from an elevator to the top deck; thence along the Flex-Chute spiral track to the lower bank back to the same elevator. Then they are distributed to the three-track Flex-Chute of the Lamb system for feeding to the Olafsson three-spindle boring machine.



By
Joseph Geschelin
DETROIT EDITOR

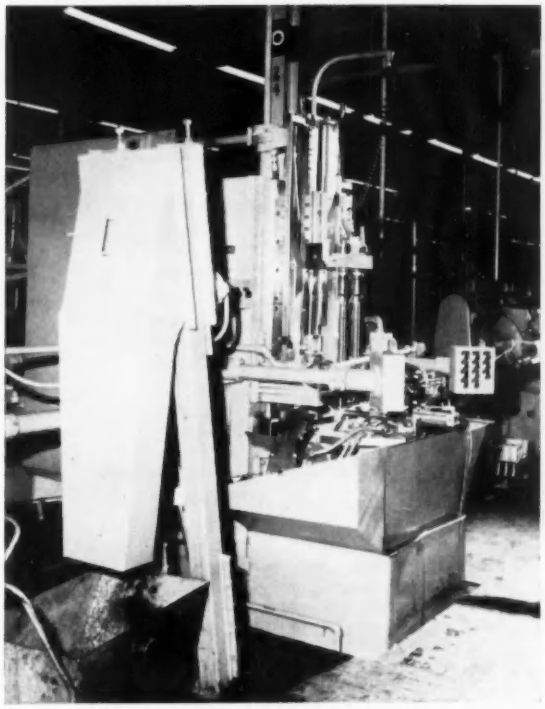
PART II

Not only does this line embody the latest types of spiral storage units, elevators, counters, diverters, etc., but all of these devices as well as the feed lines to machines are connected by the Lamb Flex-Chute. This is one of the latest developments in this field, simplifying initial installation, and providing a great deal of flexibility in the event of changes in equipment or changes in flow pattern.

Due to space limitations we shall confine this brief summary to the inner race shown in one of the illustrations. Blanks are prepared in 6-spindle, 2⅝-in. National Acme-Gridley automatic bar machines from SAE 5120 steel tubing. At the six positions these automatics face, bore, turn, recess, chamfer, ream and cut off. Blanks are washed and inspected, then are shifted to heat treat. Here they are carburized in a Holcroft batch type furnace; washed in a Holcroft batch type washer; and drawn in a Holcroft batch type furnace to Rockwell C 27-33. Blanks then are tumbled in Roto-Finish tumbling barrels and are ready for delivery to the machine line mentioned above.

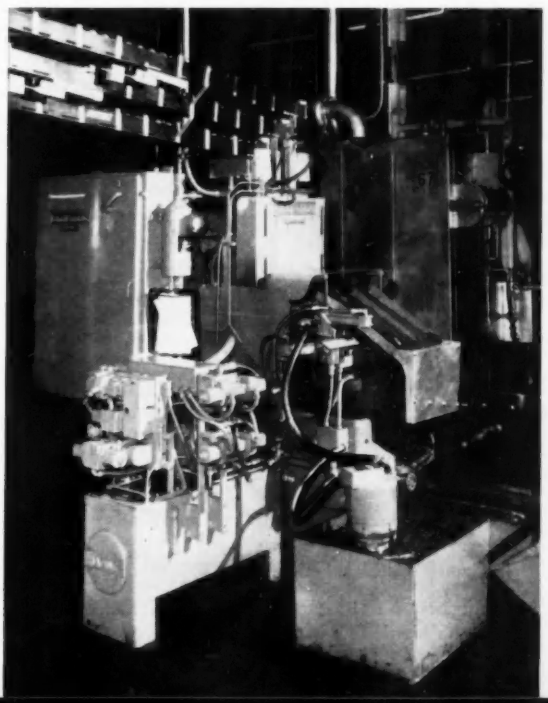
As blanks come in from heat treat they are loaded into a Feedall bulk feed hopper and delivered in oriented position directly to a large Gardner Model 2H30 double-end grinder for semi-finish grinding of both sides. It is of interest that this grinder has a capacity of 900 pieces an hour. As a result both inner and outer races are processed through this one machine in batches. The grinder is fitted with Lamb diverters at the exit end to permit the operator to switch the flow of parts either to the inner or outer race line as the case may be, diverters being actuated manually.

(More)

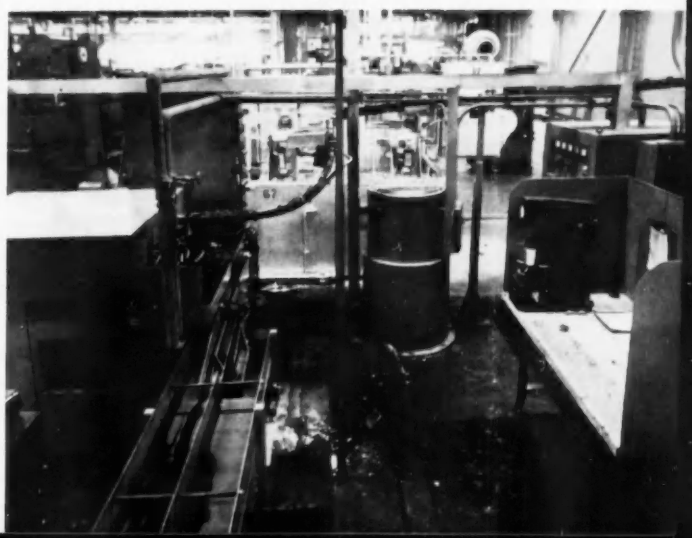


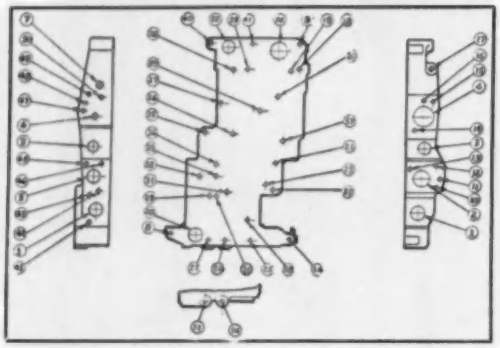
Inner races ready for finishing operations are delivered by automation to the two-station, 15-ton pull-down type American broaching machine. Parts are fed automatically to the work station, then out on the Flex-Chute seen in the foreground of the bed. This operation produces the 32 involute splines in the bore

Three-spindle Olafsson boring machine on the inner race line. Blanks are turned on the OD to semi-finish size. As at the other points along the line, operation of the machine is fully automatic.

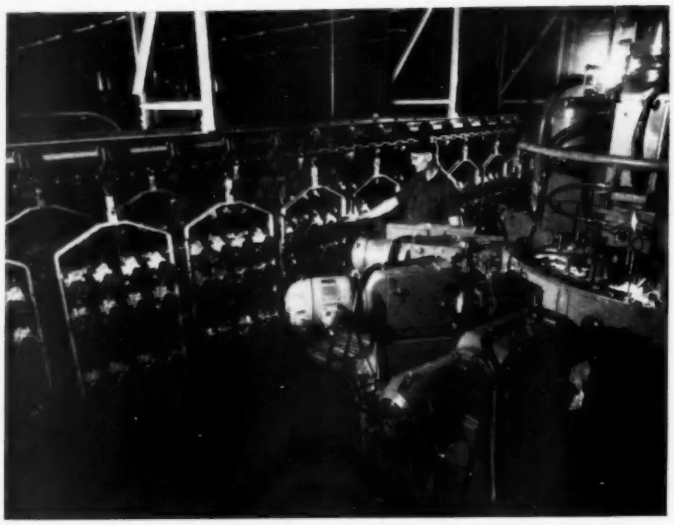


Inner races are being transported via Lamb Flex-Chute to the General Electric induction hardening units seen in this view. Looking at the machine at the left, it will be noted that inner races flow to the hardening station, are released on demand, and leave the machine along the chute in the left foreground.





Production visual aid, shown here, indicates the identification of some 59 holes, large and small, that require processing for completion of the lower control valve body. These holes are referred to in the text.



Following flat facing of the lower control valve body in a Heald facing machine, the work goes to a Kingsbury multiple-head drilling machine for handling the variety of holes mentioned in the text. This view shows similar operations on the upper control valve body, also illustrating method of transporting larger valve bodies in special carriers on monorail feeder conveyor.

Since we are considering the inner race only, we trace the course of events from the inner race diverter which shunts the flow of blanks into an elevator, then into the top deck of the Lamb spiral storage unit. Blanks feed automatically from the lower bank of the storage unit back through the same elevator, but through the rear bank side, and by Flex-Chute to the Olafsson three-spindle boring machine. Ahead of this operation parts enter a three-way divider to proportion the flow along three separate tracks to feed each of the spindles. Here the blanks are turned on the OD to semi-finish size.

Parts now flow to a Lamb washer, out on the chute to an elevator and thence to a spiral storage unit. Blanks are delivered on demand to a General Electric induction hardening machine to selectively harden the OD to RC60-65. This operation too is fully automatic with parts entering the hardening station through a tube, unloading automatically. The hardened blanks are delivered to a Waltz conveyor type draw furnace where they are held for four hours at 325 F. From here the parts are transported to a Wheelabrator grit blast machine.

Blanks now are ready for finishing operations. The first step is feeding to a 15-ton American broach of two-station, pull-down type. This operation produces 32 involute splines in the bore: DP 20/40; pressure angle 30 deg. At the same time the broach holds the ID to 1.553-1.556 in. Parts unload automatically, moving to an elevator, then to another storage unit. The work now is directed to an elevator and into a spiral storage unit from which parts are distributed on demand to two Cincinnati Model 2 chucking grinders. The operation here is semi-finish grind the OD.

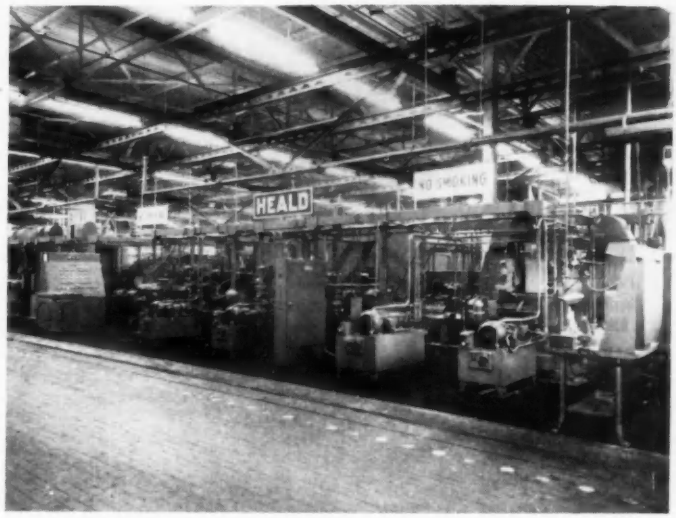
Flow from the Cincinnati grinders converges to an elevator, then moves by chute to another elevator-storage unit group to a feed hopper serving two Landis centerless grinders in series for finish-grinding and lapping the OD. This dimension is held 2.3755-2.3750 in. with surface finish specified at 15-microinch (rms). Once again the parts flow to an elevator-storage unit for feeding on demand the last major operation; finish grinding of both sides in a double-end Gardner carrier type grinder. This dimension held to 0.985-0.975 in. with surface finish of 15-microinch (rms).

VALVE BODY

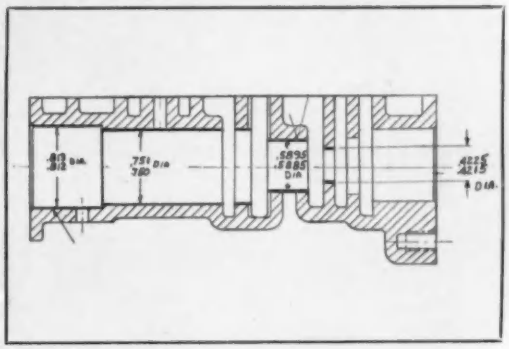
Fabrication of transmission valve bodies, particularly, as respects the large ones currently in use, always has been a major problem. The multiplicity of holes and passages, step-by-step drilling of long holes, the extreme accuracy for size and alignment, as well as the requirements of surface finish make this one of the really difficult jobs in mass production. Compounding these requirements is the fact that valve bodies usually are light, slender castings, hence subject to distortion and misalignment if not meticulously fixtured and handled.

For this discussion we have selected the lower control valve body as an example of what is required in mass production. This comes in as an aluminum die casting with cored passages and bores. It is noteworthy that Sharonville has found it feasible, probably for the first time, to complete practically the entire machining cycle on an automatic transfer machine. Up to now valve bodies have been processed on individual machines in a lengthy cycle of operations. One of the illustrations shows location and number identification of the holes.

Even so, several preliminary operations are re-



After preliminary machining the lower control valve body is transported to the Heald transfer machine line, part of which is shown here. It consists of two transfer machines: a 19-station unit for Operation 30; and a 20-station unit for Operation 40, both being of pallet type. Here the work is handled exactly as any major casting, namely one piece clamped in each pallet.



This visual aid shows the detail of the intricately machined valve gallery line in the lower control valve body. It is one of the series of operations handled in the second Heald transfer machine.

quired. The first step is the fly-cutting of the large flat face in a Heald through type precision facing machine. The part is located from cored holes 1 and 7 on one side and 3 on the opposite side. Next is the drilling and reaming of a group of holes that will serve as positive locators later on. This is handled in the versatile Kingsbury drilling machine with an indexing table. It has seven stations, one for loading, the other six working. Altogether the machine has 10 heads; a horizontal and vertical head at stations 1, 2, 4, and 6; horizontal heads at stations 3 and 5. Next is the drilling of holes 25, 32, 55, and 59; drilling and reaming of holes 8, 9, 53 and 54; reaming of hole 28.

With this initial preparation the rest of the job is done in a large Heald transfer machine installation, consisting of two pallet type transfer machines: a 19-station unit for Operation 30; and a 20-station pallet type transfer machine for Operation 40. In these machines the valve body is treated exactly the same as any major engine casting, clamping a single body on each pallet. For this purpose the casting is located on the finished face and in locating holes 8 and 9.

The first three heads rough-mill five flat sections on the sides of the body—three on one side, two on the other. This is followed by drilling some of the holes in the top face; five holes on the right side and two in the left side—at Station 6 which is fitted with three heads. Station 7 countersinks holes in the top face on the right side and drills two holes on the left side. Station 8 has a vertical head and two horizontal heads for probing the previously drilled holes. Station 9 taps nine holes with a vertical head; taps five holes on the right side; drills four holes to depth and taps one hole on the left side. This is followed by step-by-step drilling of some holes and chamfering four holes at Station 10. Station 11 probes holes at top and both sides. Additional drilling and tapping operations continue and at Station 14 these holes are probed at the top and sides.

Some further drilling is done at succeeding station with unloading at Station 18. The parts now are transferred at Station 19 (idle) to the second Heald transfer machine.

This 20-station unit is tooled primarily for rough-

(*Turn to page* 136, *please*)

The stepped valve bores finish-reamed in the Heald transfer machine are inspected 100 per cent, using the familiar Sheffield air gaging equipment.

Expanding Uses for Powdered Metal Parts

Emphasized at

MPI

15th Annual Meeting

THE Metal Powder Industries Federation Fifteenth Annual Meeting and 1959 Powder Metallurgy Show, held in Detroit April 20-22, again emphasized the expanding number of applications for parts formed from powdered metal. In conjunction with the Annual Meeting and Show a "Design Clinic for Powder Metallurgy" was staged on April 22 by manufacturers of powder metallurgy parts and the American Powder Metallurgy Institute. Experts were on hand at this design clinic to present illustrated discussions on shape, size, properties, general cost problems.

In a paper presented during one of the technical sessions, F. Emley and C. Deibel, Materials Engineering Departments, Westinghouse Electric Corp., described a new method for compacting metal or ceramic powders into continuous sections. In it they stated that the consolidation of powders into relatively large masses which may serve as end products themselves or as intermediates for further processing to final shape, is becoming increasingly important as a means of achieving many of the complex materials requirements of modern science and industry. The processing of tungsten filaments from powder raw material is a well-known example which derives its importance from the fact that tungsten, because of its high melting point, cannot practicably be fabricated into solid metal by any other process.

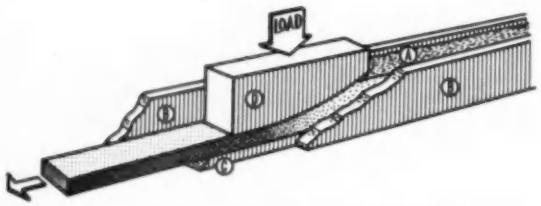


Fig. 1—Cutaway schematic view of continuous compaction setup

These advantages to be gained in the forming of large sections, especially in the field of powder metallurgy, have not been fully exploited because of limitations of current fabricating techniques.

Direct rolling of powders is the only important method being exploited at the present time for the continuous formation of solid materials from powders. The method entails the use of rolling mills similar to those used in conventional metal rolling. Powder is fed into the rolls where it is compacted into green sheet which may be subsequently or continuously sintered and then rerolled to high density. In this process, it is well established that the maximum thickness of sheet is primarily dependent on roll diameter. All reports which have come to the attention of the authors indicate that even with rolls of very large diameter the upper limit of thickness for green sheet or strip appears to be about ¼ inch. Conventional rolls will produce green strip to a maximum thickness of only 1/16 inch or less. Roll speed, another important variable in this process, must be kept low.

It is thus apparent that a very desirable innovation to the art of powder metallurgy and to allied powder arts would be a pressing technique capable of producing bars of unlimited length and relatively large cross-sectional area. Following is a brief description of such a technique for powder pressing. Patent applications covering this process have been filed.

The method which we call continuous compaction can best be described by illustrating a typical set-up for laboratory studies. Figure 1 is a cut-away sketch of such a set-up. Loose powder marked A is placed into a three-sided trough with sides marked B and a bottom

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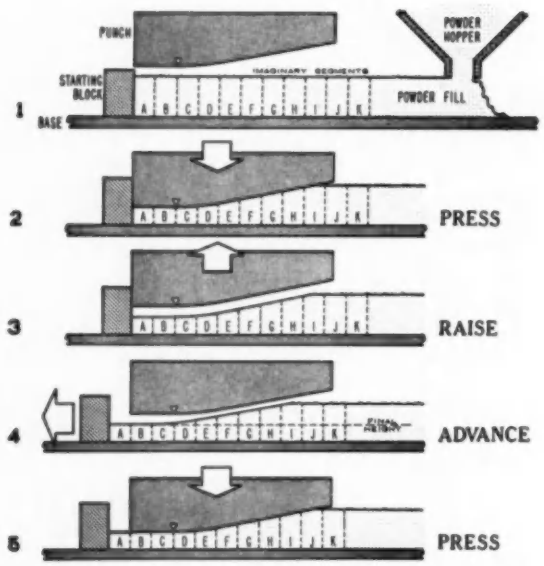
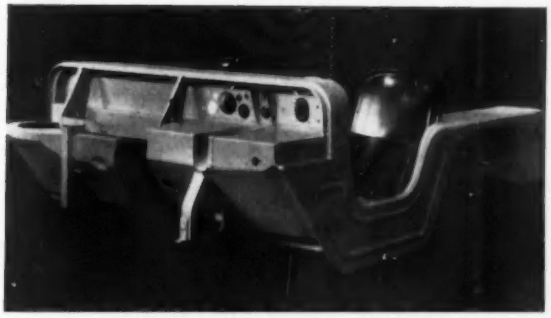
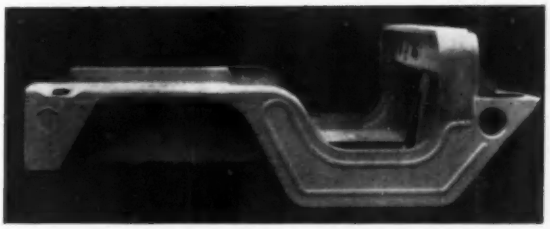


Fig. 2—Sequence of operations in continuous compaction

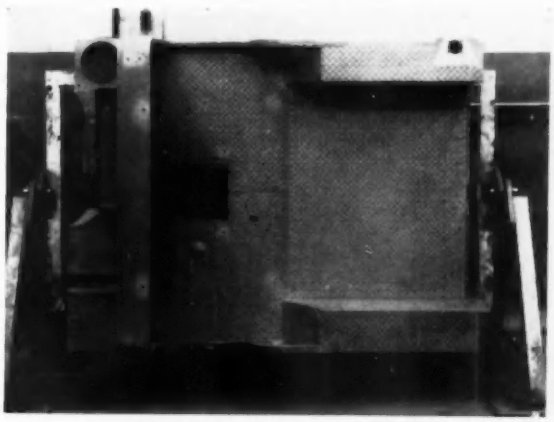
Design of the Mighty-Mite Provides High Strength-Weight Ratio



Three-quarter front view of the body



Right side view of the 106-lb body



Top view of Mighty-Mite body

THE body of American Motors' new Mighty-Mite vehicle presents an interesting solution to a difficult engineering problem, worked out by the Twin Coach Co. of Buffalo, N. Y., the supplier of the body of the vehicle.

The basic problem turned over to Twin Coach by American Motors was to produce a body for the Mighty-Mite that would be exceedingly tough, and yet weigh no more than 120 lb. Twin Coach not only met this weight target, but actually effected a saving of approximately 14 lb.

In solving the problem engineers at Twin Coach came up with three basic techniques which they used with variations throughout the body: new embossing applications, use of box sections, and reducing the number of details.

Embossing with symmetrical surface indentations strengthens the sheet metal by work hardening it and by changing the axis of the metal to get additional stiffness. Some 35 different embossing patterns were tested until the proper diamond pattern was arrived at. This provided optimum strength in all directions, without fractures in the metal subject to cracks.

The pattern used was so effective that 063 gauge sheet aluminum could be used on 96 per cent of the body. The embossed sheets were fully as rigid as sheet aluminum 0.093 in. thick.

The use of embossing would have been impractical had not the engineers developed a technique by which the configurations could be applied locally where required, skipping areas where the sheet was to be bent or spot welded. Under older embossing techniques, the configurations had to be removed where bending or welding was to take place. This lessened the integrity of the metal, as well as added an extra time-consuming operation.

Under the Twin Coach embossing method, some 20 to 30 details can be formed and embossed simultaneously with one thrust of a press.

An example of the flexibility with which embossing is applied, is a cab floor member of the vehicle. Though the major part of the surface is embossed, the detail has five specific areas where embossing is not applied. These are: splice area where it joins the cargo floor; hand brake mount; transmission cover; master cylinder for brake; and cross member for the body mount.

The box sections make it possible to build the body of the Mighty-Mite without the heavy extrusion struc-

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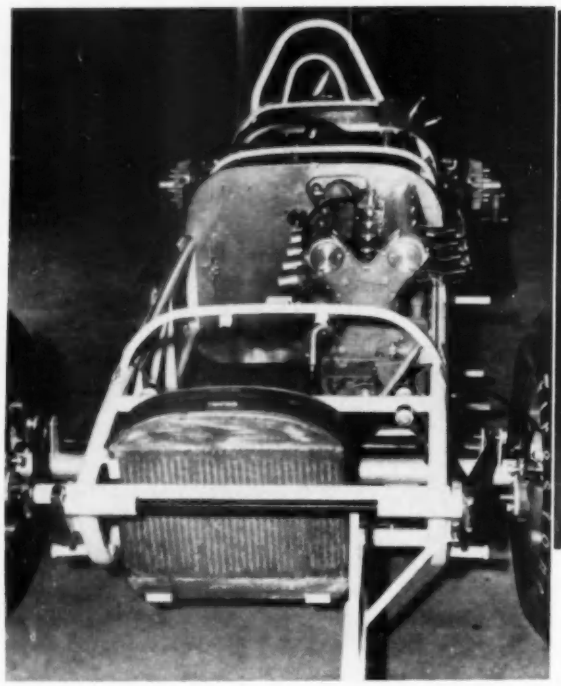
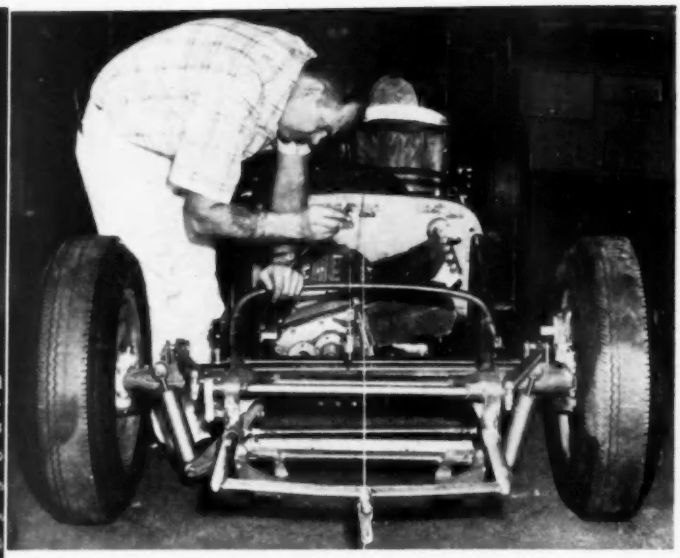


Leader Card 500 built by A. J. Watson. Radiator features faster flow by use of larger diameter tubing, less weight because of smaller overall size, and mounting to right avoids need for starter shaft passage through radiator core. Note newly-required high roll bar. Engine of this car is vertical, far to left of the car.



Mechanic Bob Phillips with Racing Associates Special. Phillips holds plumb line representing the centerline of car (between right wheels and left wheels). The longer string shows the centerline of frame and body. Distance between them is the 2 in. gain in weight distribution to the driver's left. Engine is 18 deg from horizontal, turned to the driver's left instead of usual right hand slant.

. . . New Records

ROAR of the race cars will soon be heard again. The buzz boys and the cars are all tuned up for the 43rd annual 500-mile speed classic at Indianapolis on Memorial Day.

Sixty-one cars are entered, but only 33 of the fastest cars will get into the race. It will take a sizzling 143 mph average to get a starting spot. Prize money: $300,000.

Don't be surprised to see a new one lap record of 149 mph. With good track conditions, speed for the race should average 137 mph—a record.

Years ago, getting a car ready for the 500-miler was shrouded in great secrecy. Designers and builders generally posted a "No Admittance" sign on their shops. But today everybody talks quite openly about what they're readying for the big event.

Why is it so? Most of the cars showing up at the track are alike. So why keep it a secret?

Success at the track is based pretty much on a good driver, a good mechanic, good pit crew, and a lot of good luck. And, of course, about $30,000 to start up a unit.

However, in the drive for gold and glory, the race is sure to be packed with thrills.

George Salih certainly started something in 1957 when he brought his Belond Special to the track. The engine was lying on its right side at an 18 deg angle from horizontal. The car won the race. And did it again last year!

What's New for 1960?

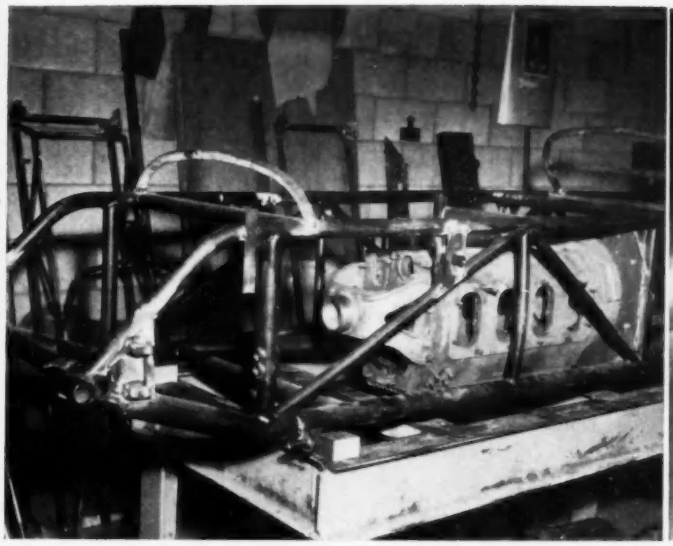
A GAS turbine engine for the 500-miler? It could happen—it's past the dream stage. Frank Kurtis, sometimes called the "Dean of American Race Car Designers," has something up his sleeve.

The author knows that Kurtis is working with Boeing Airplane Co. for use of its small gas turbine engine at Indianapolis and has a chassis design for it. There's a chance that this car will show up in the 1960 race of races.

The engine has intriguing possibilitites. It qualifies under Indianapolis racing rules. But that's not the only thing.

It's lighter than the Meyer & Drake Offenhauser —the power plant that gives the go to most of the cars in the race. The Boeing turbine, rated at 300+ hp, weighs only 325 lb vs 500 lb for the M & D. Saving 175 lb is really something!

Claimed advantages of the gas turbine for competition racing: (1) No need for a cooling system or auxiliary oil tank. (2) Use of lighter weight chassis components. (3) Smoother flow of power—no need for the rugged running gear components of today's racers. (4) All in all, a weight saving of 300 to 400 lb. This would get an Indianapolis car down to about 1200-1300 lb vs today's 1600-1700 lb.



This Kurtis-built Youngstown Mack Truck Special features frame rails 1⅜ in. top, 2 in bottom. Purpose of heavier-on-the-bottom rail is to lower center of gravity, and give greater rigidity. Illustration shows straight-up engine. Twin to this car is one of the new Bowes Seal Fast Specials. That Kurtis car, however, mounts the engine in a near-horizontal position.

Youngstown Mack Truck Special. Detail of this Kurtis-built car shows placement and metalwork on exterior oil tank.

By R. Raymond Kay
PACIFIC COAST EDITOR

Expected at Indianapolis 500-Mile Race

If the Belond Special wins again, it will be the only car ever to win three years in a row—in fact, the only car to win three times.

"Laid-down"-engine cars took first, second and fourth place in 1958. Some 16 cars of the same type will compete this year.

For the record, Frank Kurtis offset engines in 1952, when he built the Cummins Diesel and Keck Fuel Injector cars. The Cummins set new one and four lap qualification records that year. And the Keck car, with Bill Vukovich driving, dominated most of the race.

This year's 500-miler will again be a Meyer & Drake derby. The 4-cyl. M & D 255-cu-in. Offenhauser engine will power at least 30 of the 33 starters. That's allowing starting positions for three of the four non-Meyer & Drake powered entries: the two 168-cu-in. Novi V-8s and two 255-cu-in. Maserati V-8s.

Several new Meyer & Drake engines made this year will get the "laid down" treatment, and five older models are converting to this type of installation. Most "laid down" engines slant to the right. However, two will slant left.

One owner is turning his engine counter-clockwise, reversing the conventional right hand rotation. He hopes that the reversed driving torque reaction will give better chassis handling in the turns.

Leo Goossen, Meyer & Drake's chief engineer, reports all new engines have a 7½-in. center-length connecting rod. And many of the older ones converted to this length. This design calls for a new short cylinder block and an M & D 220 cu in. gear tower assembly. Those older engines not converted have 8-in. rod centers with a higher block and gear tower. A new fuel pump drive assembly is available for use with a recently designed Hilborn pump. The pump has greater capacity.

There's a brand new oil collector sump and breathing system for the "laid down" engines. This is to overcome oil collection difficulties.

Valve lifts are still increasing, with a high of 15/32. Most popular is 7/16. Also, several engines are replacing the radius tappet with flat-faced valve tappets.

Pistons are again aluminum impact forged with compression ratios of about 14:1.

For the first time, you'll find titanium used in one car. And in another, an aircraft-type electrical instrument panel to replace gages.

Indianapolis cars have drawn on some of the aircraft industry experience. This is natural since most of the race car builders are in the backyard of the southern California aircraft plants.

Many of the cars, engines, drivers, and mechanics come from California. Some designers, mechanics, and drivers have had aircraft industry training. And a few still work for the industry.

Aircraft influence is seen in use of spot brakes, airflow styling, welding in place of riveting, and use of lightweight metals. *(Continued on next page)*

Engine of Simonize Special built by A. J. Watson. Engine is an upright 252 cu in. Meyer & Drake Offenhauser with a 220 cu in. gear tower. Note the Scintilla magneto mounted at the right, in front of the engine. Hilborn fuel injection intake manifold shows tubes drawing air from a vertical position instead of the usual horizontal position.

Dean Van Lines Special built by Eddie Kuzma features a tear-drop-shaped outrigger oil cooler tank. It's made from 20 ga terne-plate and has a horizontal air cooling flow hole of 2 in. diam. Tank is 11-in. diameter at widest point. It's 30 in. long, with 8-gal capacity. Upward flare of body panel gives better streamlining and driver protection.

The car to watch is the Racing Associates Special. Builder Lupigi Lesovsky's design idea is to get weight distribution that will take advantage of the 800 left hand turns in the race. Here's how he's doing it: (1) placing the chassis 2 in. off center to the left, (2) slanting the engine to the left, and (3) putting the driver on that side.

This arrangement is just the opposite of "laid down" engine cars that did so well last year. It will be interesting to see how these weight shifts improve performance.

Horizontal frame rails on this car are $1\frac{3}{8}$ in. 4130 chrome moly tubing. Vertical distance between them is 13 in. Another innovation: a fabricated bell crank with eight holes to allow for a variety of ratio steering combinations. The vertical bell crank idler shaft is mounted outboard of the chassis frame rails, although the drag link will run inside the car.

An eight gallon outrigger oil tank, made of 0.083 in. aluminum sheet, sits in a specially made outboard saddle.

Borrowing from passenger cars, Lesovsky built and installed a dished safety steering wheel.

Interesting mechanical features include: (1) A new cross flow radiator, $3\frac{1}{2}$ in. thick, $13\frac{1}{2}$ in. high, and $21\frac{1}{2}$ in. wide, with a starter shaft opening through it. (2) A manually operated clutch to cut out the weight of a hydraulic system and avoid possible failure of the fluid lines.

It's likely this car will be one of the lowest and lightest in the race. Ground level to top of headrest rail bar measures 34 in. and from top of cowl to ground, $24\frac{1}{2}$ in. Car's weight is 1636 lb dry.

Two new Frank Kurtis built cars will be his 500-J Model series. One is a Bowes Seal Fast Special; the other is the Youngstown Mack Truck Sales Special.

Kurtis changed his thinking on size of frame rails for the 500-J's. The upper horizontal rails are $1\frac{3}{8}$ in. while the lower are 2 in. Vertical height between their centers is 13 in. Purpose is to reduce weight; lower the center of gravity with larger rail on the bottom; and give greater frame rigidity. The car is 3 in. lower than previous models.

Another first for Frank Kurtis. He's using titanium in the Bowes Seal Fast Special. This will give him, he says, a 46 per cent weight saving over use of steel. And a 100 lb cut in the overall weight of the car. Titanium parts are steering arms, linkage torsion bar arms, and rear axle support brackets.

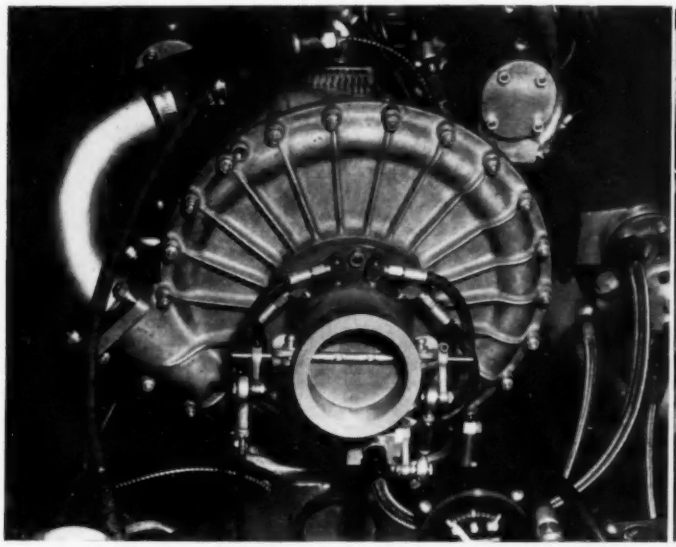
Young builder-mechanic A. J. Watson, with 1955 and 1956 Indianapolis winners already to his credit, has two new cars for the race. Both the Leader Card Special and Simonize Special have the familiar Watson design feature; extensive use of weight-saving magnesium for body panels. He likes and uses the vertical engine installation.

Watson figures 30 lb saved there per car. Another weight reduction is a 17-lb fiber glass tail section instead of a 40 lb unit of aluminum.

In the Leader Card Special, Watson installed a manually operated clutch and a conventional stock brake master cylinder.

The Simonize Special is another car to watch. It won the 100-mile Daytona Beach International Speedway race last month. Jim Rathmann, who drove it at an average speed of 170.261 mph, broke his 1958 Monza, Italy, 500-mile record average of 166.772 mph.

Watson will have a Meyer & Drake engine for the



Powerful Novi engine, with a 14-year racing history. For the first time it has a Hilborn fuel injector instead of aircraft-type carburetors. Photo shows four injector nozzles mounted on supercharger intake side. At press time the system was undergoing dynamometer tests. Jean Marcenac, Novi chief mechanic, had not decided whether to use two or four nozzles.

Newly installed instrument panel on Novi Car. It's an aircraft type—blinking red and green lights instead of gages. Advantage is elimination of gage lines, which vibration sometimes breaks loose. Also, driver gets a quick idea of what's going on. Lights show fuel pressure, oil pressure, oil temperature, and water temperature. The other instrument on the panel is a tachometer.

Simonize Special. And again he is using the 220 gear tower in place of the 270. That makes his block $\frac{5}{8}$ in. shorter. Quite a few cars this year will show up at the track with this design. Watson says the arrangement allows for a shorter stroke, $4\frac{3}{8}$ in. vs $4\frac{5}{8}$ in.; connecting rod $7\frac{1}{2}$ in. vs 8 in.

Quinn Epperly turned out two new cars, the Hoover Motor Express Special and a Bowes Seal Fast Special. The Bowes car was damaged in the recent Daytona Beach accident which killed driver George Amick.

Top frame rails on both cars are $1\frac{1}{4}$ in. lower than in Epperly's 1958 models. This makes it easier to get to the spark plugs. It also gives the racer smoother lines.

An interesting feature is an idler arm as a vertical support on the drag link. It's expected to improve rigidity and lessen vibration. Steering should be easier, Epperly says.

Motion pictures of last year's race clearly pointed the finger at the drag link vibration. Therefore, the idler arm. It's 40 in. forward of the steering gear box assembly.

Dean Van Lines and Pete Schmidt Specials—two new ones from Eddie Kuzma's shop—both have their engines slanted towards the right at an 18 deg angle from horizontal.

A new teardrop-shaped outrigger oil cooler tank, of 20 ga terneplate, has a horizontal air cooling flow hole of 2 in. diam. The tank is 11 in. at its widest, 30 in. long, and holds 8 gallons.

Front torsion bar mounting is over the front axle.

Another new idea in the Kuzma cars is a "bathtub-type" bulge at the body alongside the driver's elbow. It lets him keep his arm and elbow inboard and permits use of a wrap-around windshield to cut wind buffeting and improve streamlining. The bulge measures $4\frac{1}{2}$ in. outward from the body line.

For the first time, the famous and powerful Winfield engines in the Novi cars will use fuel injection. The Hilborn fuel injector replaces the aircraft-type carburetor used up to now.

Mechanic Jean Marcenac points to a weight saving: 4.5 lb Hilborn unit vs 27 lb aircraft-type carburetor. And he hopes for better performance and fuel economy.

Needing less fuel now, Marcenac disposed with the side tank entirely and enlarged the rear one. Total capacity is now 68 gal in the one tank. The cars formerly carried 80 gal.

To lighten the front end load, Marcenac moved the engine back three inches on its chassis. He believes he'll get better handling this way.

A newly installed instrument panel is especially interesting. It's an aircraft type with blinking red and green lights instead of gages. This cuts out the gage lines which vibration can break loose. And gages, themselves, are sometimes difficult for the driver to read during the race.

The red and green lights indicate fuel pressure, oil pressure, oil temperature, and water temperature. A standard tachometer is the only other instrument on the panel.

An eyebrow lifter is the Greenman-Casale Special, with driver Jimmy Davis in the cockpit.

Chief mechanic Ernie Casale not only laid down his engine, but stuck it $9\frac{1}{2}$ in. out the left side of the car's body. It sits right out in the open.

Casale's reasoning: he cuts 8 in. of height off the

(*Turn to page* 140, *please*)

Recent Advances in Static Controls

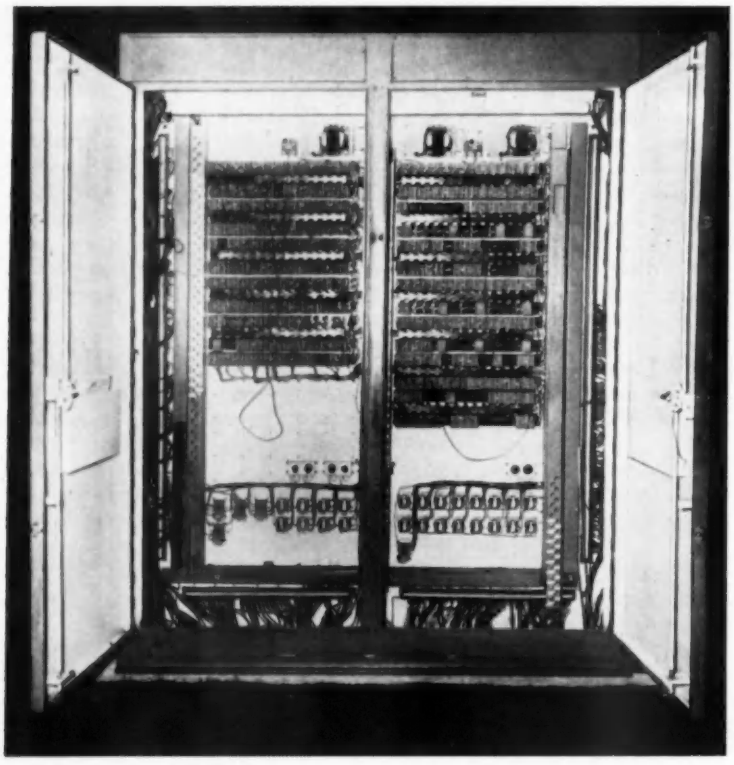
discussed at

23rd MACHINE TOOL FORUM

PROGRESS developments in static controls, roll-forming equipment, and variable-speed drives, including recent applications in automotive plants, were but a few of the many interesting topics discussed at the 23rd Machine Tool Forum, sponsored by Westinghouse Electric Corp.

Other subjects viewed were electronic sensing, magnetic holding fixtures, and a numerically-controlled boring machine, as well as sliding bolster presses and even a look at the stamping plant of the future.

FORD—Typical of the Cypak control cabinets in the Sharonville plant is the one illustrated. It is part of three sections applied to a Heald 32-station pallet-type transfer unit that machines automatic transmission governor valve bodies of cast iron at the rate of 250 pieces per hour. Phase indicating testers at the top of the cabinet are for checking out circuits.



The meeting, held in Buffalo, N. Y., on April 14-15, had, as heretofore, the basic theme — "Engineering for Tomorrow . . . in the Machine Tool Industry."

This year added speaker participation from the automotive and machine tool industries was in evidence. Among the 22 technical presentations, five of the speakers were from automotive companies and 12 from machine tool companies. Ralph J. Kraut, president of the National Machine Tool Builders' Association and president of Giddings & Lewis Machine Tool Co., as well as Ludlow King, executive vice-president of the Association, participated as guest speakers. Similarly, a very large proportion of the more than 400 executives and engineers in attendance were representatives of the two industries.

As is always the case, Westinghouse engineers, too, made valuable contributions by way of technical presentations on latest electrical equipment developments.

Transmission Plant

The experience gained in setting up "the largest single installation of industrial static control systems in the world" was reported by I. L. Hosek, equipment engineer, Ford Motor Co., and N. L. Caban, machine tool engineer, Westinghouse Electric Corp.

This installation is in Ford's new automatic transmission plant at Sharonville, Ohio, where the facilities "are coordinated and timed so as to permit the completion of one automatic transmission every 20

By
Charles A. Weinert
EASTERN EDITOR

seconds." There are 23 applications of static controls in 19 multi-operation transfer machines, two automatic grinders, and two automatic "super-finishers." Some 6700 Cypak modules altogether are used in the machine tool controls.

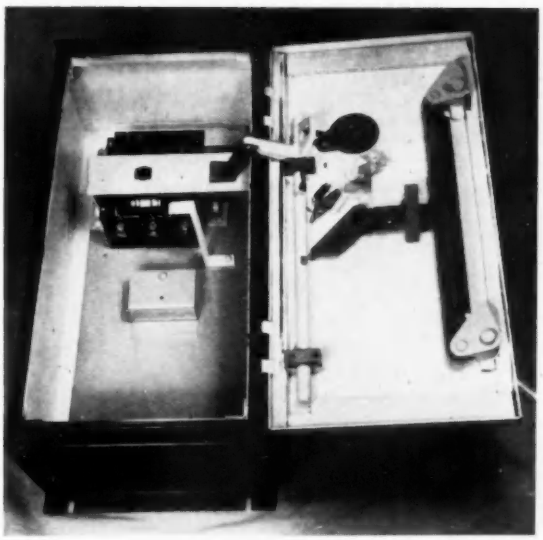
Ford, prior to the design of the controls, supplied the manufacturers information as to the desired machine sequences and safety features. It was stipulated that circuits for specific machine functions be packaged as control system modules, and that the modules be positioned in the cabinet to coincide with the machine station locations. Another requirement was that an indicator lamp be provided for each input and each output of limit switches and other pilot devices. Requirements were also established as to location of manual control stations, wiring practices, drawings, and numbering of electrical components.

In developing the controls, engineers found that the use of such information as a sequence of operations for the machine, a hydraulic circuit diagram, and a bar chart showing the operation of pilot devices on the machine, was an effective and simplified approach to the design. Since transfer machine control systems require that a single signal be supplied to many modules, it was also found that a considerable reduction in components could be achieved by using care in originating such signals at the most effective point.

Control Enclosure

A new design of control enclosure, developed by a user to incorporate features considered essential for the safety of his maintenance personnel, was described in a paper co-authored by C. H. Collins, plant engineer, and L. S. Thomas, chief electrician, Pontiac Motor Div.

Designed as a starter enclosure, the device has linkage between the door operator and the disconnect so arranged that the disconnect can be locked in an open position regardless of the door position. Latching of the door in closed position is by a 90-deg twist of a handle, superseding bolting or similar methods which were found too time-consuming. *(Continued on next page)*



PONTIAC—Starter enclosure has linkage between door operator and disconnect so designed that disconnect can be locked in open position regardless of door position.

AUTOMOTIVE HEADLINERS AT WESTINGHOUSE FORUM SESSIONS . . .

I. L. Hosek, Equipment Engineer, Sharonville Plant, Ford Motor Co.—"At the Ford Sharonville Plant is housed the largest single installation of industrial static control systems in the world."

C. H. Collins, Plant Engineer, Pontiac Motor Div.—"Over a period of four years we have spent about $36,000 to provide this protection (safety of personnel and equipment), on combination starters in sizes one through four alone. Consideration of other sizes, designs and classifications . . . would add many more thousands of dollars to this figure."

R. E. Russell, Chief Equipment Engineer, Stamping Div., Chrysler Corp.—"Large stamping plants usually schedule production on two shifts, leaving the third shift open for die changing. The press plant of the future, with the same number of presses as a given present-day plant, will process through its quick die change presses about 25 per cent more steel in 24 hours of operation, producing a much greater variety of parts."

John Zambrzycki, Electrical Engineer, Engine & Foundry Div., Ford Motor Co.—"A fully automated line or any segment thereof must operate in a predetermined sequence if it is to operate at all. If a single machine unit does not fulfill its function the machine should stop . . . "

F. W. Duncan, Plant Equipment Engineer, GMC Truck & Coach Div.—"In modified Kramer drives, we have an a-c adjustable-speed motor in the totally enclosed fan-cooled construction, which we in the automotive industry have found desirable."

The effort has culminated in three electrical equipment makers being in a limited position at present to fill orders for the improved enclosures.

Features of the new designs include switch handle always in control of the switch, and sealing of the door by actuation of a cam device. In some cases, the starter cannot be engaged until complete sealing takes place by manually completing the cam action. Provision is made for permitting enclosure opening while power is on, but a simple tool and familiarity with the equipment are required. Improved wiring and maintenance clearances, and room for additional control transformer capacity and interlocking have also been provided.

The authors centered their remarks on combination starters and disconnects, but added they were "as equally or even more interested in having the specification apply to all control enclosures, and particularly to the large enclosures used to house the extensive control systems on machine tools."

JIC Standards

In commenting on the use of JIC (Joint Industry Conference) electrical standards as actually applied on automated production lines, John Zambrzycki, electrical engineer, Engine & Foundry Div., Ford Motor Co., was highly complimentary about their effectiveness.

He said the standards "contain a lot of sound and practical engineering advice," and that many people do not fully understand the meaning and purpose of their requirements. The intent of the standards is "to provide the highest level of personnel safety, to prevent machine damage, to assure proper part machining, to provide means for easy and efficient trouble-shooting, and, of course, to assure reliability of operation," he declared.

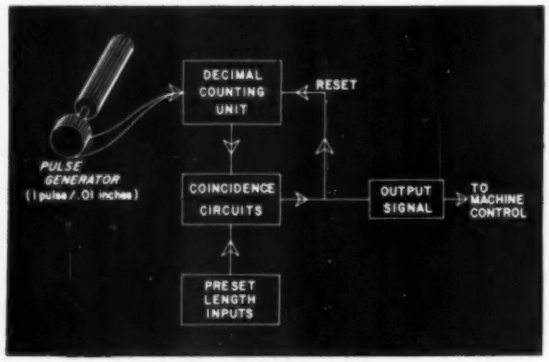
Mr. Zambrzycki analyzed a number of the specific requirements of the standards in pointing out how they function in relation to operational needs. The speaker concluded his remarks by saying that "adherence to JIC electrical standards has saved many people from accidents, many machines from damage, many parts from being scrapped, and many hours of machine down-time."

A-C Adjustable-Speed Drives

Modified Kramer drives are considered by one user to be ideally suited to certain adjustable-speed applications in automotive component manufacture. The reasoning behind this belief was contained in a paper presented by F. W. Duncan, plant equipment engineer, GMC Truck & Coach Div.

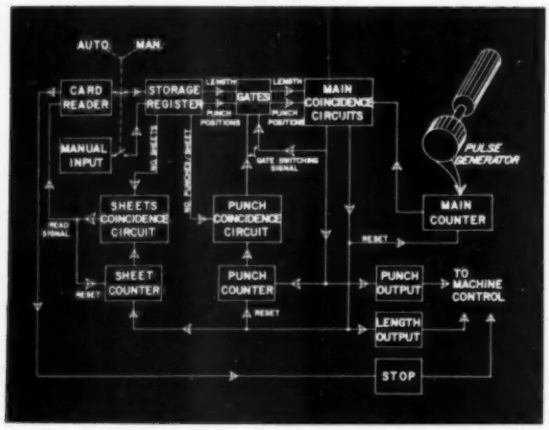
He mentioned that among the desirable features of the drive were over-speed protection, permanent balance, repetitive performance, absence of reverse bends in the speed-torque curve, smooth starts, and inherent speed regulation from no load to full load.

Mr. Duncan said his company had already installed, or was in the process of installing, a total of 14

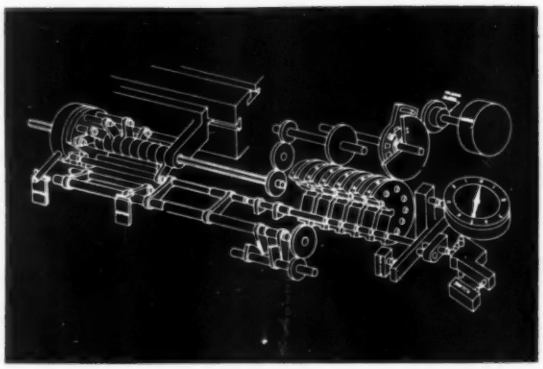


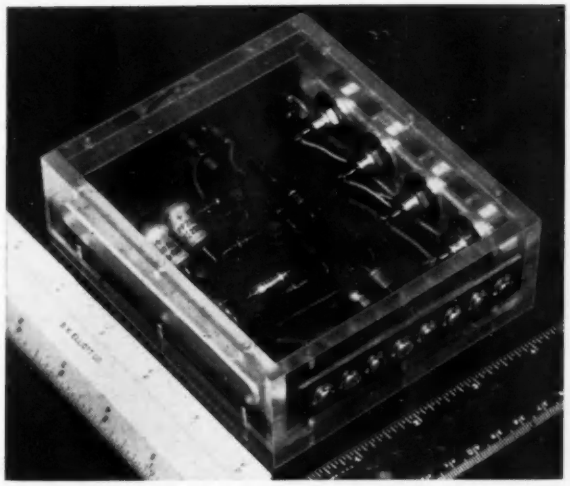
McKAY — Block diagram of single-program manual-input measuring system on roll former.

McKAY—Block diagram of multiple-program automatic-input control and measuring systems for roll-forming equipment.

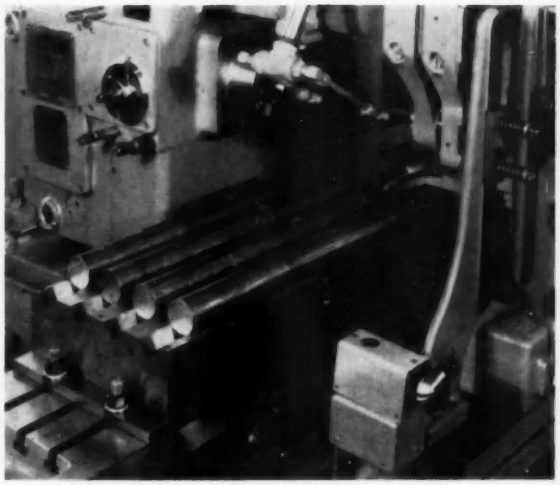


FOSDICK—Mechanical alignment of Class A gages is the basic principle of the direct-measuring system on a precision boring machine. This illustration shows the addition of power drive to one dial.





WESTINGHOUSE—Model of the silicon Trinistor triode static a-c switch.



SUNDSTRAND—Keyway milling of shafts using magnetic vee fixtures. Fixtures are attached to electro-magnets wired in parallel.

grinders for finishing crankshafts. Ten of the machines are rated at 25 hp, four at 15 hp, and all of them have a speed range of 2:1. Each has a totally-enclosed fan-cooled drive of the new type. The drive unit is built on a single frame, with the a-c wound rotor component and the d-c component on one shaft with two bearings.

The speaker stated his company had also purchased a special lathe for machining crankshafts which will use a modified Kramer drive rated 25/50 hp, 550/1650 rpm. In this particular application two circuit features have been incorporated—one to give low creep or inching speed, and another to provide dynamic braking for quick slow-down and stopping.

Stamping Advances

In a presentation entitled "A Look to the Future in Stamping Plant Equipment," R. E. Russell, chief equipment engineer, Stamping Div., Chrysler Corp., commented on some of the significant strides which have occurred in the metal stamping industry.

He said one of the most important recent developments was the quick-die-change or sliding bolster press which "enables the change-over from a roof to a floor pan, or from a hood to a deck lid in six minutes flat, instead of from four to six hours. . . ." And predicted that future press plants so equipped would be capable of processing not only a greater variety of parts, but also about 25 per cent more steel each 24-hour work day.

The speaker mentioned as another "major break-through in pressroom technology" the application of the modular design concept to presses with shuttle-type transfer mechanisms.

The Rectiflow variable-speed drive, developed by Westinghouse, was also mentioned as an important contribution to flexibility of press operations. Mr. Russell said that two new 400-ton blanking presses, scheduled for early delivery to Chrysler's Mack Stamping Plant, will be equipped with 50-hp Rectiflow drives that will cycle the presses at 20 to 60 spm.

Programmed Roll-Forming

A new system which enables the automatic programming of roll-forming equipment and adds to the equipment's versatility was detailed by C. W. Thomas, assistant sales manager, The McKay Machine Co.

The system is based on the recent development of an electrical measurer which consists principally of a pulse generator and counting device. The pulse generator is coupled to a roll that is driven by the passing strip material, and it produces electrical impulses in units of lineal measurement. The electrical counter (which is capable of counting rates of hundreds of thousands per second) is preset to the total count which represents the desired part length.

Speed regulation and position control of the cut-off element is separately provided by a drum-type cam with machined groove and captive cam follower connected to the cutting unit or die set.

The program may be handled by using multiple sets of dials or switches set by the operator. This system includes preset channels, each of which has intelligence as to part length and number of parts to be produced. Upon completion of the first channel's cycle, transfer to the second and subsequent channels' "instructions" is automatic—and with no break in the output of the equipment. For this type of program control, the speaker said the practical limit seemed to be a total of about 10 channels with 100 pieces per channel.

Another method of program control is by means of a punched card or perforated tape system in which the data is given to the measuring device via suitable readers and data transfer apparatus. In this way a variety of non-duplicating cycling of machine functions is obtainable under completely automatic control.

(*Turn to page* 110, *please*)

Cost Saving Techniques Disclosed at Annual Meeting of ASTE

By Kenneth Rose
MID-WEST EDITOR

SOME interesting ideas about cost control were presented at the Annual Meeting of the American Society of Tool Engineers, held in Milwaukee April 19-22. The theme of the meeting was "Planning for Profit," and new types of machine tools, techniques in processing, and planning for production were discussed.

Speaking of "Cost Control in Quantity Production," R. L. Witsche, General Supervisor, Mechanical Engineering Research, International Harvester Co., said that the company's diversified products must be engineered to take full advantage of the best tooling and processes available to be priced competitively. This is done by integrating and coordinating the know-how of four operating groups: advance planning; manufacturing; cost reduction, and manufacturing research.

The advance planning group, composed of experienced manufacturing men, works with product design engineering groups and manufacturing personnel. The second group, manufacturing, actually plans and installs manufacturing equipment and processes for the product. The third group continues an aggressive cost reduction effort after the initial design, and the fourth group, manufacturing research, studies application of new materials, processes, and tools, and provides consulting services for putting them into use.

In "Control of Research and Development Costs," H. Dale Long, President, Scully-Jones & Co., pointed out that many companies today were doing much of their business in products not in existence five years ago. Most industrial organizations are doing applied research and development. To hold down development costs, mock-ups of paper, cardboard, and wood are prepared to get dimensions and an idea of the action or motion involved. Research is considered as an investment, and is taken out of profits. Model costs are controlled by the manufacturing division budget, and are set at ½ of 1 per cent of sales.

The manufacturer who does not use his depreciation dollars to replace obsolete equipment as fast as the dollars accrue may find rising replacement costs bringing him a loss, said Carl M. Beach, Exec. Vice-Pres., Heald Machine Co., in his talk, "Capital Costs and You." Based upon the year 1900, labor costs were up 1000 per cent; construction costs up 550 per cent and equipment costs up 400 per cent.

Several papers dealt with developments in machine tools, or with the selection of machine tools by industry. Richard Thuma, Superintendent of Tools and Maintenance Dept., Allis-Chalmers Mfg. Co., in his paper, "Machine Selection and Application in a Large Industrial Plant," gave three reasons for need of new capital equipment, (1) to increase productive capacity, (2) to reduce costs, and (3) to meet new or changed product specifications.

Before deciding upon purchase of new equipment, three alternatives should be considered: decreasing idle time on existing facilities; decreasing machining time by using faster cutting tools; and rebuilding and modernizing old equipment. If no one of these alternatives satisfies requirements, and increased capacity is required, first consideration is usually given to a modern counterpart of the existing facility, with use of a different type of machine to perform the same operation, or a change in manufacturing processes and acquisition of machinery required for this, as alternates.

If the reason for need of new equipment is to reduce costs, the suggested means would be the same as for increasing capacity. For the third, to meet new or changed product specifications, reasons might be (1) new products not previously made; additional machines or new or special machines needed; (2) larger parts, requiring larger machines; (3) configurations requiring processes impossible or too costly on existing equipment; (4) changes in material, requiring new methods; (5) closer tolerances, requiring other methods or more accurate machines. From such an analysis, the type machine needed can be determined.

Die and mold milling developments have resulted in a new method for contour machining that effects major cost reduction, said Darwin H. Bingham, Jr., Sales Department, G&L and Hypro Div., Giddings & Lewis Machine Tool Co., in his talk, "Current Developments in Numerically Controlled Die Sinking Machines."

The five basic steps in programming a die are planning, preparation of work sheet, key punch machine preparation of computer input cards, new set of punched cards produced by computer from key punch data cards, and punched paper tape produced by tape converter from computer output cards. This tape serves as the input to the numerical director to the machine. In the future, the computer operation and the card to tape conversion will be combined into a single step.

The decision to have a director at each machine, or to have a director remotely located and a simple playback system at the machine, depends upon the number of machines, the cost limitations, and so on. If only one machine is to be bought, it can be provided with a director that interpolates the data

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Triumph Herald Features Separate Chassis Frame with All-Independent Suspension

Four-passenger sedan which has a 7-ft, 7½-in. wheelbase with 25-ft turning circle, overall length is 12 ft 9 in., width 5 ft, height 4 ft 4 in., and curb weight 1750 lb.

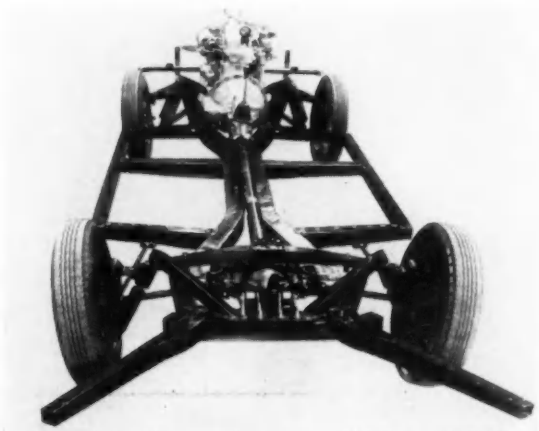
THE Standard Motor Co. breaks with British small-car tradition by basing its new Triumph Herald on a separate chassis frame with all-independent suspension. The frame is fabricated from box- and channel-section members with the differential mounted rigidly between the flared backbone sections. Driven by swinging half-shafts, the rear wheels are sprung by a single transverse leaf and located by radius rods.

A feature of the chassis is the complete absence of grease points. Half-axles are coupled by permanently-sealed needle-roller universals, while the same type of joints are used on the one-piece propeller shaft which requires no sliding spline. All suspension joints use rubber or nylon greaseless bushings.

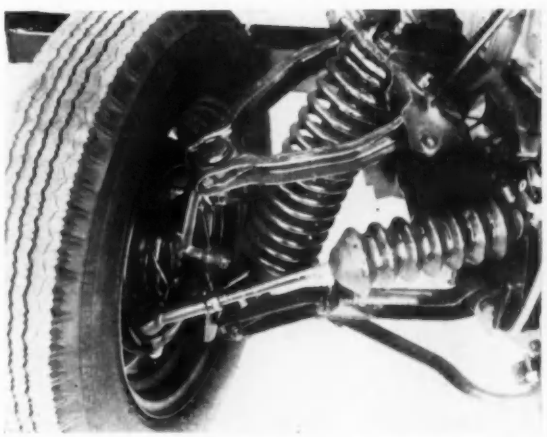
The front suspension employs double support arms with a telescopic shock absorber centered in the coil spring. Swivel pins are supported by a threaded lower bushing incorporating its own oil reservoir, and a special wear-resisting ball joint on top. Steering is by rack and pinion linked by synthetic bushings.

The body, styled by Michelotti of Italy, is produced as a two-door, four-passenger sedan and a two-passenger sports coupe. Among design highlights are a bottom-hinged front body section, comprising hood, grille and fenders, that swings forward to give full access to the engine and front suspension;

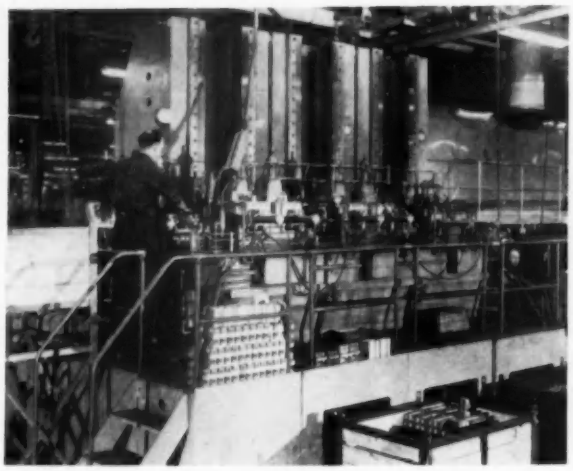
(*Turn to page* 126, *please*)



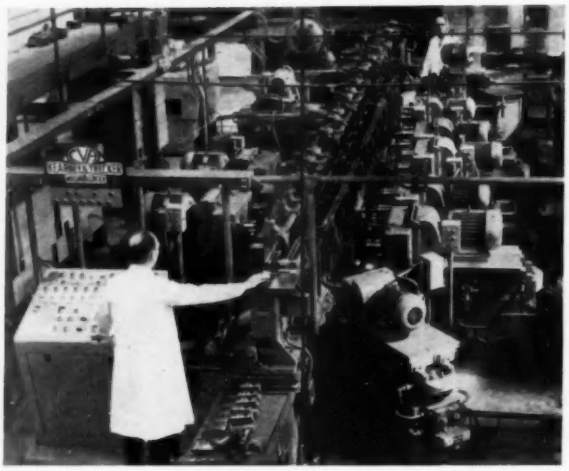
Herald chassis is formed from box- and channel-section welded members; rear half-shafts jointed to rigid differential



Front wheel assemblies use synthetic or grease-packed joints on the suspension and steering elements



Weatherly Oilgear transfer broach machines bearing caps in six stations. Universal fixtures take three or four bearing clusters for the two Vauxhall engines.



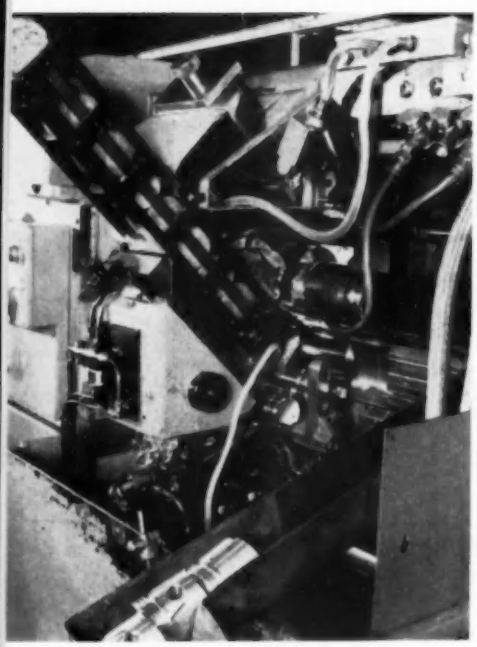
Kearney & Trecker 11-station line drills, bores, taps and finally separates the bearing clusters.

Retooled Vauxhall Plant in Britain Uses Latest American Equipment

By David Scott

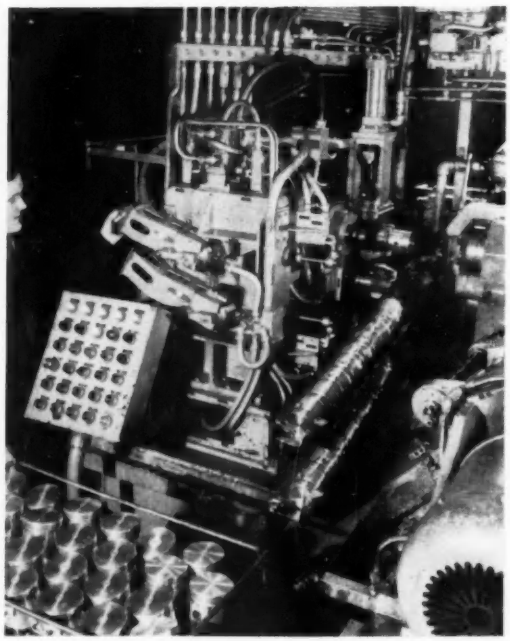
ASIDE from the new building housing the car press and welding shops and final assembly lines (described in AI of April 15, 1958), complete re-tooling of the main machine shop was one of the major projects of the $100 million expansion program carried out by General Motors' Vauxhall plant in Britain. About $67 million has been spent on the most modern equipment, much of it American.

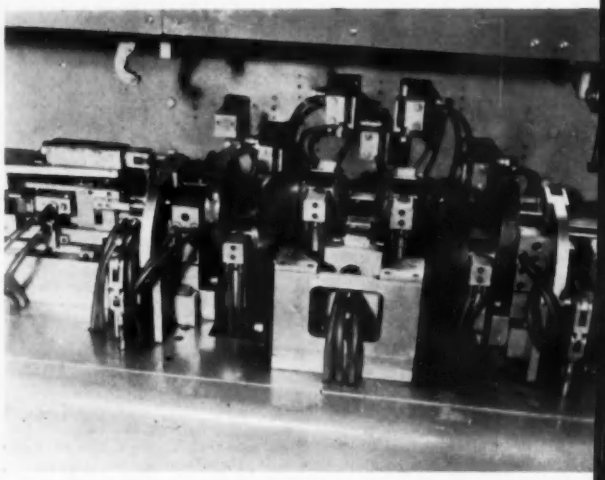
Over 1000 new machine tools were installed in the 19½- acre building formerly devoted to the manufacture and assembly of Bedford trucks (which are now made in nearby Dunstable), where production is concentrated on car engines, transmissions and axles.



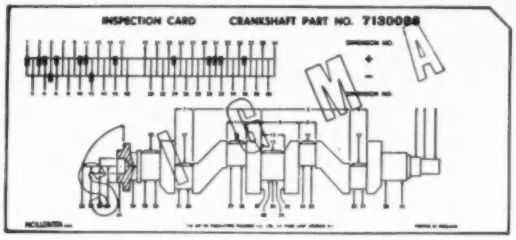
Automatic loader of the Ex-Cell-O rotary indexing machine on the piston line that bores the wrist pin hole and roughs the skirt. The mechanism positions pistons with reference to the offset pin hole, then extracts a pair from the dual magazines and inserts their crowns in the chucks at the loading station.

Wickman six-spindle chucking automatic with magazine loading turns, faces and grooves pistons in an 11-second cycle.





Close-up of the multi-gage inspection head that checks 41 demensions on the rotating four-cylinder crankshaft.



Sample Hollerith card punched to indicate faulty dimensions.

Sigma three-station air gage automatically checks 41 dimensions on the 4-cylinder crankshaft. The shuttling pick-up mechanism, housed in the upper cabinet, transfers the cranks from the positioning station at the left to the central gaging station, then to the unload blocks for visual inspection. The liquid columns at the right indicate all measurements simultaneously, while punch cards are ejected from the slot below when tolerances are exceeded.

Altogether 22 automatic transfer machine lines are in use.

These include not only the accepted lines for engine blocks, cylinder heads and gearbox housings, but also transfer equipment for broaching bearing caps, gear hobbing, machining steering knuckles, assembling valve guides and tubes, inspecting crankshafts, and other unusual applications.

In addition, there are several examples of automation applied to individual machines, such as those on the piston line, where magazine loading and mechanical pick-off devices lend themselves to anticipated linking up. Much of this equipment is used for producing both the 4- and 6-cylinder engines (for the Victor and Velox/Cresta cars), which have the same bore and stroke and many parts in common.

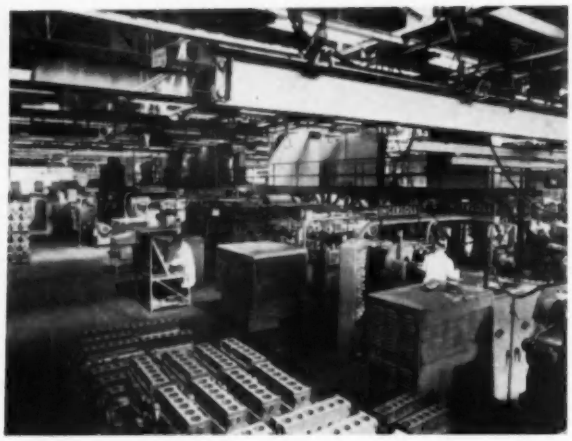
Main bearing caps are initially machined on a six-station transfer broach built by Weatherly Oilgear. Castings comprising a cluster of three or four caps (for the 4- and 6-cylinder engines respectively), are hand-loaded vertically into the first station, where the semi-circular bearing faces are cut. The flats are machined at the second station, after which the casting is automatically turned through 180 deg on its vertical axis to present the rear face for broaching at the third station, and both sides at the fourth.

A hydraulic kicker then knocks the cluster down to a horizontal position for machining one end and grooving the sides at the fifth station. This operation is repeated on the other end at the sixth station, following rotation of the work on a horizontal plane. The machine can be changed over from three- to four-bearing clusters in a short time by repositioning the limit switches on the location rams at the fifth and sixth stations.

After broaching, the castings drop by gravity chute to the loading station of an 11-station Kearney & Trecker transfer line that drills and bores the caps, as well as tapping the oil-pan mounting holes on the end bearings for these deep-skirt engine blocks. Finally, the clusters are split by a multiple saw at the last station. Transfer mechanism on this line consists of counterbalanced rocker beams on an overhead shuttling bar.

While the crankshaft lines incorporate a considerable amount of automatic machining and handling equipment, the outstanding feature is the terminal units for fully-automatic inspection, duplicated for the 4- and 6-cylinder components. Developed by Sigma Instrument Co. in conjunction with Vauxhall, these are three-station machines that check 41 dimensions on the smaller shaft and 56 on the larger, recording the data of rejected pieces on Hollerith punch cards.

After final washing each shaft is automatically loaded onto a pair of vee-blocks at the first station, where a small motor driving through a clutch assembly rotates it to the correct position for subsequent inspection. This is controlled by one of the crank pins contacting a fixed stop, when a micro-switch also actuates the transfer mechanism consisting of an overhead lifting carriage with



First Ingersoll 13-station line for engine blocks mills the head, pan and various mounting faces as well as the crank half-bores, and rough bores the cylinders. Like all the machines in this section, it has universal tooling and fixtures to take both the 4- and 6-cylinder blocks.

Two Barnes transfer machines are linked by a turnover fixture to give a continuous line of 48 stations, the longest at the Vauxhall plant.

pick-up claws. At the same time this air - operated mechanism moves the preceding workpiece from the inspection to the third or unload station.

At the second station the work is lowered onto the measuring fixture, comprising a bank of air gages, which first checks 28 static dimensions (on the six-cylinder shaft) by means of gaging heads fed forward against the shaft. The work is then rotated by pressure rollers driving the flange, while fixed and moving gaging heads make a further 28 dynamic measurements on the journals and pins.

Each measurement is registered on individual liquid columns whose height alters in accordance with distance and diameter variations. When tolerances are exceeded a red light gives visible warning, and a punchcard indicating the faulty dimensions is automatically produced. The crankshaft's rotation is stopped at the correct position, after which it is transferred to the unload station for visual inspection and manual removal. Maximum output is 40 pieces per hour.

As stated earlier, the piston section consists mainly of individual automatic mechines with loading and unloading devices to facilitate future integration into a fully automatic line. Rough castings are initially turned on a pair of Wickman six-spindle chuckers adapted for magazine loading and internal chucking. Cycle time on each of these is 11 seconds, and operations include rough turning, facing and chamfering the crown, and cutting the three ring grooves.

This is followed by an Ex-Cell-O four-station rotary indexing machine that works two pistons simultaneously at each station. The sequence covers rough-boring and chamfering both ends of the piston pin hole; rough-machining the open end and skirt interior; and drilling the piston pin oil holes and the skirt for the saw cut.

Of special interest is the automatic loading mechanism, whose function is complicated by the fact that the wrist pin hole used as a locating reference is offset by 1/16 in. The loading unit consists of a pair of transfer arms that withdraw the pistons from the two input magazines, then swing horizontally through 90 deg to insert the crown ends of the work into the twin stationary chucks on the rotary table.

At the start of the operation, each loading arm advances axially towards a piston, engages its skirt with a pair of jaws, and slowly rotates it with a to-and-fro motion. Correct radial orientation is controlled by a locating plunger, bearing against the piston and offset to correspond with the displacement of the wrist pin hole,

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Valve guides and tubes are inserted in the cylinder heads on this 4-station transfer unit based on a Weatherly Oilgear horizontal press. Heads enter the machine at the rear of this picture, where guide bores are brushed out. They are then transferred forward through the central tunnel while components are hand-loaded in the grooved magazines at the third and fourth stations.

Users of Construction Equipment Air Views at Earthmoving Industry Conference

MANUFACTURERS were given the opportunity to hear what users of construction equipment would like to see designed into the machine when, at a session of the SAE Central Illinois Section, 10th Annual Earthmoving Industry Conference at Peoria, April 14-15, representatives of users discussed desired trends in equipment. Following are some of the suggestions by men from the companies using earthmoving equipment.

A better brake system with adequate, self adjusting, totally enclosed brakes. The aircraft type brake might be adapted to these machines.

A full power shift transmission, with an adequate number of ratios, capable of satisfactory performance without a fluid member to handle shock.

The crawler tractor must continue to improve to keep pace with the development of rubber-tired prime movers. It should be rugged as it is called upon to do jobs for which no other machine seems to be satisfactory. Electric components, particularly generators and regulators, should be more reliable. Maximum trouble-free life of final drive components is needed.

An air-cooled Diesel engine capable of equaling the performance, weight, and size of the present liquid-cooled engine. Until the appearance of this new engine, higher horsepower and less maintenance on conventional engines would be desirable.

Full power steering should function satisfactorily through the full range of engine speeds. At present, drivers complain of performance under down hill haul and at idle engine speed.

Improved piping is needed. As many components as possible should be designed to utilize internal plumbing passages. A hose with superior resistance to abrasion, and heavy walled pipe should be used. Junction block connections and short flexible hose to needed points, with a clamping system that clamps each line individually, would reduce maintenance costs. ■

Meeting of the Lead Industries Association and American Zinc Institute

THE pick-up in the storage battery business, lowered concentration of tetraethyl lead in gasoline, better chrome-plating procedures for zinc die castings, and improved workability of galvanized iron came under discussion at the joint meeting of Lead Industries Association and American Zinc Institute in Chicago April 22-24. Evans Taylor, Chicago manager for Exide Industrial Div., Electric Storage Battery Co., gave the meeting estimates that indicate 1959 will approach, and perhaps surpass, 1957 in sales of storage batteries, and will be substantially better than 1958. About 90 per cent of our battery output, figured on a basis of tons of lead, was in automotive batteries.

In addition to the SLI (starting, lights, ignition) battery service for the automotive industries, Mr. Evans called attention to the growing number of electric golf carts that have appeared within the past few years. Each of these uses lead batteries at 10 to 20 times the rate of consumption of the ordinary automobile. Small electric pleasure vehicles have appeared in a few communities, such as Long Beach, Calif. "There is every reason to believe that electric vehicles powered by lead storage batteries will gain wide acceptance and use in the next few years," he said.

Concentration of tetraethyl lead in gasoline has gone down appreciably during 1957 and 1958, J. A. Costello, Vice-pres., Ethyl Corp., said, and this accounts for a loss of 14 per cent in use of lead for this purpose even while gasoline sales rose about one per cent from 1957 to 1958. In 1956 the tetraethyl lead content of regular gasoline had reached 2.2 milliliters per gallon, while by December of 1958 it had fallen to 1.5 milliliters. This represented about 40,000 tons of lead a year lost, largely due to the process of catalytic reforming of gasoline.

Production of zinc from domestic mines in 1958 was 24 per cent below 1957, and was the lowest yearly rate in 25 years, said C. R. Ince, Vice-pres., St. Joseph Lead Co. He attributed this to the depressed prices that prevailed, and showed that, though imports of metal declined 38 per cent, the imports of zinc in concentrates declined only

(*Turn to page* 102, *please*)

Preview of the 1959
DESIGN ENGINEERING SHOW

A HUGE $10,000,000 exhibit of some 12,000 products to help research and development executives and engineers plan the products of the 1960's will be unveiled in Philadelphia's Convention Hall May 25 through May 28, during the 1959 Design Engineering Show.

Four hundred companies will display products and about 4000 experts will be on hand to answer the questions of the expected 18,000 visitors from all over the world. The exposition, begun in Philadelphia three years ago and held in New York and Chicago since that time, is now one of the largest and most important annual industrial expositions in the United States.

On display will be metal alloys, plastics, synthetic rubber, power transmission equipment, electrical and electronic components, all sort of mechanical components, various shapes and forms, fasteners and adhesives, finishes and coatings, hydraulic and pneumatic components, engineering equipment and services, and virtually everything else which goes into the making of an industrial or consumer product.

Concurrently with the show will be an intensive four-day conference staged by the Machine Design Division of the American Society of Mechanical Engineers. These sessions will be divided into two days of general meetings and two days devoted to the specialized needs of engineers interested in the use of materials, mechanics, or power and control.

The general sessions will be devoted to a report on engineering in Germany, general design engineering problems, and the more effective use of engineers in industry.

Hellmuth Walter, director of research, Worthington Corp., in his paper on conditions in Germany, will describe the technical education of German engineers, the role of the engineering executive in German industry, the loss of German engineering talent to the U.S.S.R., and the relationship of engineering to other phases of industry.

At another session on the last day, the efficient organization of a design department from the viewpoint of both the company for efficient operation, and the engineer for proper use of his talents, will be discussed.

The two material sessions will be "Latest Developments in Plastics, Metals and Ceramics for 1000 F Service," and "Latest Developments in Materials and Coatings to Resist Corrosion." The mechanical sessions will be devoted to methods of power transmissions and the theory and selection of bearings. For the power and control sessions, there will be "Direct Current Drive Systems and Conversion Devices" and "Digital Systems and Logic Circuits for Controls."

Complete Conference Program

MONDAY, MAY 25

ENGINEERING DESIGN OVERSEAS

Co-Chairmen—Dr. Joseph W. Barker, chairman of the board, Research Corp., New York, and Carl W. Besserer, assistant program director, Minuteman Project, Space Technology Laboratories division, Ramo-Wooldridge Corp., Los Angeles

"Engineering Design in Germany"

Speaker—Hellmuth Walter, director of research, Worthington Corp., Harrison, N. J.

TUSEDAY, MAY 26 (Concurrent Sessions)

MATERIALS

Co-Chairmen—John C. Redmond, consultant, Pittsburgh, and Robert N. Peterson, supervisor, application design group, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

"Latest Developments in Plastics for High Temperature Service"

Speaker—Irving J. Gruntfest, materials studies, Aerosciences Laboratory missile and space vehicle department, General Electric Co., Philadelphia

"Latest Developments in Metals and Ceramics for High Temperature Service"

Speaker—Julius J. Harwood, head, metallurgy branch, Office of Naval Research, Department of the Navy, Washington, D. C.

POWER AND CONTROL

Co-Chairmen—Donald G. Dutcher, chief electrical engineer, Hanson-Van Winkle-Munning Co., Matawan, N. J., and R. W. Barnitz, chief electrical engineer, Jones & Laughlin Steel Corp., Pittsburgh

"Variable Speed DC Drive Systems"

Speaker—M. H. Sluis, electrical engineer, Pratt & Whitney Co., Inc., West Hartford, Conn.

"DC Conversion Devices"

Speaker—J. J. Rheinhold, vice-president, Richardson-Allen Corp., College Point, N. Y.

(*Turn to page* 146, *please*)

What's NEW at the DESIGN ENGINEERING SHOW

CONVENTION HALL
PHILADELPHIA, PA.

May 25-28, 1959

FOR ADDITIONAL INFORMATION
use reply card at back of Issue

Fastening Developments

More than a dozen fastening advances, including strong and heat-resistant bolts, will be exhibited by SPS.

In addition to new products, the following products will be shown:

Special fastening devices made for atomic aircraft engines, atomic submarine reactors, Atlas missiles and thermonuclear weapons.

Self-locking screws (nylon locking pellet in the thread) featuring outstanding shock and vibration performance.

Giant fasteners and other precision machined parts—some up to six feet long—made for peace-time atomic reactors.

Lightweight, highly corrosion-resistant aircraft and commercial parts made from titanium alloys and pure titanium.

In addition to new products and special displays, the company will exhibit a complete line of standard aircraft fastenings and other products. *Standard Pressed Steel Corp. Booth 617.*

Circle 251 on postcard for more data

Nylon Pressure Tubing

A flexible polyamide tubing which can be used continuously in an oxidizing atmosphere at temperatures up to 225°F will be displayed in the Polymer booth.

Called Grade TR, the tubing has an expected life of two to five years in water at temperatures as high as 150°F. *The Polymer Corp. of Penna. Booth 315.*

Circle 252 on postcard for more data

Manual Starters

An all new manual starter rated thru 7½ hp 440-550 V a-c and 2 hp 230 V d-c will be shown in the Furnas booth.

Two moving parts replace complex mechanical linkages in the pushbutton mechanism. A direct mechanical acting thermal overload operates independently of the second overload and pushbutton mechanism. This "trip-free" overload makes it impossible for the operator to hold the circuit closed against overload.

An optional feature for this manual starter is a "jog-run" accessory for precise positioning on ac applications. *Furnas Electric Co. Booth 1650.*

Circle 253 on postcard for more data

Aluminum Products

Aluminum products, including Unistrength pipe and bright aluminum alloy X5557, may be seen in the Alcoa display.

Unistrength pipe is a seamless, one-piece pipe combining thin walls with a standard wall thickness at pipe ends. It is adaptable to all joining methods. The ratio of thick to thin walls is selected to provide uniform bursting, tension and bending strength along the pipe's length after welding.

Alloy X5557 makes possible lustrous anodized finishes and should find application in the automotive and appliance industries. It is available in coiled or flat sheet or plate, as well as circles and blanks. *Aluminum Co. of America. Booth 1324.*

Circle 254 on postcard for more data

Electric Motors

Among the items to be included in the Reliance display will be a-c and d-c electric motors, submersible motors, hermatic motor parts, the Super 'T' V-S variable-speed drive system fractional hp electric motors and gearmotors.

The new drives feature a pre-set speed control device, and timed acceleration and deceleration. Speed control is available over an 8 to 1 range by armature voltage, and a 4 to 1 range by field control. A variety of operator's stations are available, including independent mounting stations, flush-mounting stations, and explosion proof stations for operation in hazardous atmospheres. *Reliance Electric & Engineering Co. Booth 1229.*

Circle 255 on postcard for more data

(Turn to page 76, please)

What's NEW at the DESIGN ENGINEERING SHOW

CONVENTION HALL
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Damping Material

Among materials to be shown for the first time are a vibration damping material, and a new cork and silicone rubber material called LC-800 for high temperature sealing.

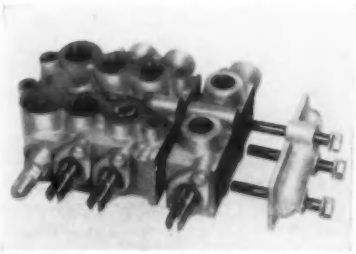
The damping material was designed to be useful in a variety of applications requiring high damping efficiency at moderately high temperatures. Among these uses are reduction of vibrations in aircraft fuselages which are subject to large driving forces at take-off power.

LC-800 combines the advantages of cork with silicone rubber. *Armstrong Cork Co. Booth 117.*

Circle 256 on postcard for more data

Fluid Power Pump

Hydreco dual-vane fluid power pumps will be on display in the *New York Air Brake Co.* booth. This line



of pumps will be available for operation up to 2000 psi and in capacities to 3 to 140 gpm at 1200 rpm. They will also be available in various configurations of foot or flange mountings, and will be equipped with standard pipe flanges.

In addition, the Hydreco hollow plunger control valve built around a basic two spool housing to which may be added additional control sections as required will be shown. The capacity of this valve would be 20 gpm at 2000 psi. It would be available in both three way and four way motor spool designs. *Booth 1053.*

Circle 257 on postcard for more data

Complex Castings

Intricate castings will be displayed in the Meehanite booth. Castings, used in the production of military tanks, will be shown. These castings had to be completely free from defects since the intricate sections varied in thickness from ¼ to 2 in.

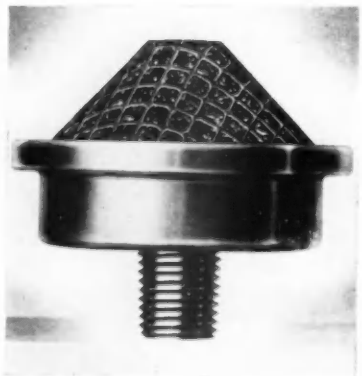
Meehanite's microstructure consists of a controlled, uniform dispersion of graphite throughout a pearlitic matrix. The resulting uniform density throughout the metal means that Meehanite may be poured in both heavy and light sections with minimum danger of draws, shrinks, openness of grain, and other casting defects. *Meehanite Metal Corp. Booth 218.*

Circle 258 on postcard for more data

Exhaust Silencer

One of the items to be featured in the Air-Maze display will be the Muffl-Maze exhaust silencer.

This unit can effectively silence high noise levels when added to all air exhaust ports or piping. Shock waves created when exhausting compressed air to atmosphere are broken up to attenuate objectionable noise—and without impairing mechanical ef-



ficiency of air operated equipment through build-up in back pressure. It is also effective as an intake silencer. *Air-Maze Corp. Booth 1624.*

Circle 259 on postcard for more data

Driven Blind Rivets

Star Pin-Grip hammer driven blind rivets for permanent fastenings to metal and wood may be seen in the Star display.

These rivets are said to eliminate the need for explosives, special tools or special skills. Aluminum alloy Pin-Grip body is assembled with a stainless steel, knurled drive pin. When the pin is driven flush with the Pin-Grip head, the slotted shank expands and grips firmly. Simultaneously, the knurled pin locks itself in position. *Star Expansion Industries Corp. Booth 1106.*

Circle 260 on postcard for more data

Speed Reducers

A new line of fin and fan cooled speed reducers will be introduced by Ohio Gear at the show. Called the "Hi-Line" series, they are designed with external cooling fins plus an in-

tegrally mounted air circulating fan to reduce heat rise.

They are available in a wide variety of styles and sizes including vertical models with high or low base, horizontal models with worm upper or worm lower and models with N.E.M.A. "C" flange for motor mounting as alternate to the standard input shaft. Units are available in sizes ranging from 1.33 to 5.25 in. center distance. *Ohio Gear Co. Booth 1641.*

Circle 261 on postcard for more data

Needle Roller Bearing

Kaydon will feature their thin shell needle bearing at the show. These bearings are meeting all requirements for automatic transmissions operating at speeds up to 6000 rpm. Simplified construction and prepacked lubrication save time on the assembly line. *The Kaydon Engineering Corp. Booth 1516.*

Circle 262 on postcard for more data

Metal Partitioning

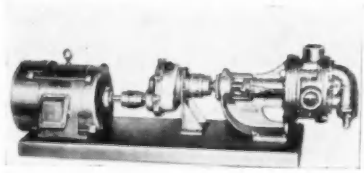
Safe-Gard expanded metal partitioning, designed for use to departmentalize plants, and for use as conveyor guards, will be displayed in the Globe exhibit.

Simple and economical to erect utilizing patented quick erect clips. It is extremely flexible in moving or changing within the plant and can be had in any dimensions required. *The Globe Co. Booth 1507.*

Circle 263 on postcard for more data

Heavy Duty Pumps

Viking heavy duty pumps with helical gear reductions will be shown in the Viking display. The wide range of speeds offered in this line of heavy duty rotary pumps permits easy changing of pump speeds for handling thick or thin liquid. Gear ratios of 4.19 to 1, 5.06 to 1, 2.76 to 1, 3.40 to 1 and 6.27 to 1 are offered on these units with 1750 and 1150 rpm motors. All five reducers are interchangeable. Pumps with 35, 50, 90 or 115 gpm capacity are mounted on an enclosed form steel base with motor and reducer. Maximum pressure which can be handled is 200 psi on lubricating liquids and 100 psi on non-lubricating



liquids. Any of the three components can be removed without disturbing the other two. *Viking Pump Co. Booth 1610.*

Circle 264 on postcard for more data

Power Rollers

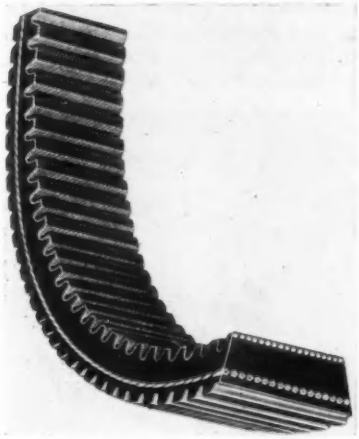
Power rollers with magnetic brakes to prevent overcoasting, a new type of female press brake die with roll inserts which eliminate work marking and reduce die set up and change-over time, a new hand operated 36 in. shear with inclined ram, and a new leaf-type box finger brake with undercut fingers and one inch clearance between fingers and bed will be shown in the *O'Neil-Irwin Mfg. Co.* booth.

Other Di-Acro machines to be displayed include: benders which form tubing, bar, angle, channel, iron pipe and other ductile materials, rod parters which will part off stock without distortion, and Di-Acro punch presses which handle up to 16 gage steel. *Booth 615.*

Circle 265 on postcard for more data

Replacement Belts

Browning Mfg. Co. will display a new line of replacement belts for variable speed units. The "VS" belts



are available in a wide range of sizes for all popular makes and models. *Booth 911.*

Circle 266 on postcard for more data

Industrial Products

Continental Diamond's display will include Di-Clad laminates in various grades for printed circuit applications, specially designed and constructed shipping cases for delicate instruments, a complete line flame-retardant laminates and other high heat-resistant materials, a full selection of products made from Teflon and special laminates for missiles and rockets. The exhibit will also feature a line of specialized industrial plastics. *Continental Diamond Fibre Corp. Booth 416.*

Circle 267 on postcard for more data

High Strength Nickel

The International Nickel Co. exhibit will emphasize that consideration of materials is an inseparable part of good design, and that the nickel-containing alloys embrace such a wide range mechanical and physical properties that they can satisfy design requirements in wide fields of industrial application.

Materials featured will include ultra-high-strength nickel alloy steel, stainless steels, high nickel alloys, nickel plating, and ductile iron. Examples of specific machinery and equipment parts will be shown in certain instances, and in others technical charts or illustrations will be used. *Booths 811, 912.*

Circle 268 on postcard for more data

Snap Acting Switches

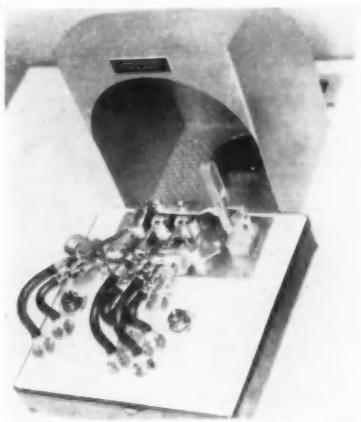
A high precision snap-acting switch, called the TyniSwitch, will be on display in the American-Standard booth.

The switch is said to be the only unit in which the bias and stresses which produce the snap action are inherent in a single piece beryllium copper blade. *Detroit Controls Div., American Standard Corp. Booth 1511.*

Circle 269 on postcard for more data

Precision Cleaner

Cobehn's booth will display the Model VR-3RS-2 precision cleaner which critically cleans contacts in voltage regulators for cars, trucks, buses, and boats at the rate of 600 units per hour. Bracket mounted automatic sprayers provide narrow cones of high velocity filtered heated air to spray a controlled volume of a chemically pure solvent. The spray combines with the air to remove oil,



wax, grease, silicone lubricants, resin flux, and fingerprints. Cleanliness is achieved without film or residue. *Cobehn, Inc. Booth 1619.*

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What's NEW at the DESIGN ENGINEERING SHOW

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Featherweight Bearings

The Messinger display will emphasize featherweight bearings, in both ball and roller bearings.

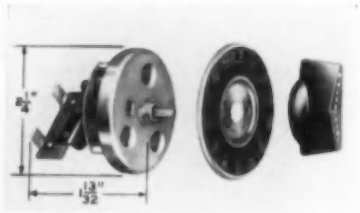
These products are designed to meet the need for special thin section large diameter bearings. In addition to displaying standard bearings, the company will show a special large 84 in. diameter radial roller bearing. *Messinger Bearings, Inc. Booth 121.*

Circle 271 on postcard for more data

Time Switch

The M. H. Rhodes, Inc. display will feature the "Mark-Time" switch. This unit is useful in many industrial and domestic applications and is rated at 15 amps, 125 v ac.

Its unique feature provides 2-in-1 utility; by turning the knob to the left, it becomes snap (off-on), turning the knob to the right supplies a timing function. The unit has stationary male terminals for solderless connectors. It can be supplied with a bell for signaling the end of a pre-set time period. *Booth 305.*

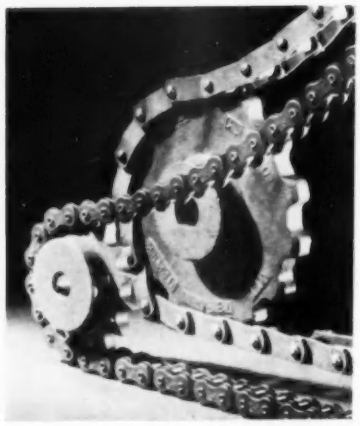


Circle 272 on postcard for more data

Drive Chains

Chain Belt will feature the Rex A.S.A. roller chain (Foreground) which is a precision chain made to rigid specifications and quality-controlled in manufacturing to insure high fatigue strength for handling high speeds and heavy loads. It is available in single or multiple strands.

Also to be shown is the Chabelco steel chain (Rear) which is one in a series of Chabelco drive chains built to close tolerances and heat-treated by advanced methods to assure long continuous service drives of heavy-duty drives operating at slow to moderate speeds. *Chain Belt Co. Booth 605.*



Circle 273 on postcard for more data

High Precision Bearings

In the Hartford booth will be a special display of Vers-o-line bearings. These bearings have wide application and interest since they are specially developed for each application and often use functional parts of the end product to form bearing races. They combine high precision with controlled tolerances and are available in unitized construction single row, opposed angular contact and thrust series. *Hartford Steel Ball Co. Booth 1007.*

Circle 274 on postcard for more data

Vinyl Metal Laminates

Vinyl clad steel products, as used in the manufacture of interior automotive parts will be on display in the *Shwayder Brothers, Inc.* booth. This product has found application in parts such as, instrument panel extensions, seat side shields, window garnish moldings, and ash tray covers. *Booth 806.*

Circle 275 on postcard for more data

Socket Screw Feeder-Driver

The Bristol Co. will feature a gun-type socket screw feeder-driver. The machine, for either portable or stationary use, will automatically feed and drive all standard socket set screws.

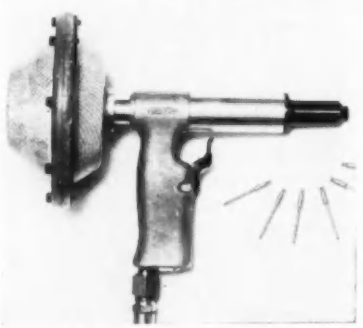
From a rotating hopper, screws are fed to a selector for orientation. The screw is then pneumatically transported to the gun. An air-powered driver in the gun seats the screw to a preset depth or torque. The gun, which may be hand-held or easily mounted, provides versatility which expands the applicability of automatic feeding and driving. *Booth 1133.*

Circle 276 on postcard for more data

Closed-End Rivet

A closed-end "Pop" rivet, a lightweight riveting gun weighing less than four pounds and the Model A eyeletting machine will be featured in the *United Shoe Machinery Corp.* display.

The "Pop" rivet, known as the Imex, is air and water tight at pressures as high as 500 psi, is highly resistant to vibration and can be set with the standard tools used for "Pop" rivets. It is set by pulling a mandrel into the rivet shank, spreading and setting it. Radial expansion of the shank is balanced with shear strength criteria to insure tightness under conditions of excessive vibration. *Booth 1204.*



Circle 277 on postcard for more data

(*Turn to page* 80, *please*)

The world's most popular

Power Brake is Hydrovac

because . . .

Vacuum power provides instant, effortless power braking *plus maximum dependability* and safety—even if power should ever fail, brakes can be applied manually.

Vacuum power saves dead weight. This can add several hundred extra pounds to every pay-load. And extra pounds mean extra profits.

Vacuum power does the job simpler and better with less maintenance and lower original cost!

Vacuum power steals no horsepower as it is completely free of compressor drain on engine power.

Unchallenged facts like these have made Hydrovac® Vacuum Power Braking first choice among truck operators—in fact, with over 5½ million sold, more Hydrovac units are in use than all other types.

HYDROVAC (VACUUM HYDRAULIC) POWER BRAKING BY BENDIX

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION

Circle 140 on Inquiry Card, for more data

What's NEW at the DESIGN ENGINEERING SHOW

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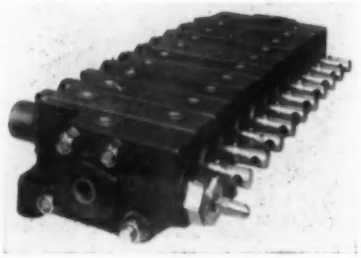
Fluid Power Controls

Commercial Shearing's display will include a new model fluid power control consisting of three series of fluid power gear pump—delivery range 3 to 95 gpm for continuous duty operation—pressures up to 2000 psi.

Other devices include fluid power directional control valves having an end use of directing and controlling



fluid power piped to hydraulic cylinders and motors. *The Commercial Shearing And Stamping Co. Booth 1412.*

Circle 278 on postcard for more data

Ball Bearing Devices

Nice Ball Bearing Co. will display a line of ball bearings for tractor and farm implement applications.

Included in the line in a wide variety of sizes are wire guide and plunger guide rollers, cam followers, power takeoff support assemblies and others.

Although designed initially for farm machinery usage, many of these bearings will have industrial uses. Nice will also show their lines of radial, thrust and combination radial and thrust ball bearings as well as many special bearings for a variety of uses. *Booth 1108.*

Circle 279 on postcard for more data

Flame-Retardant Laminates

Three laminates featuring flame-retardant qualities will be featured in the Synthane display.

Grade FR-2 is paper-based with a flame-retardant resin binder, and has excellent electrical and mechanical characteristics. It is furnished either plain or copper-clad, with copper-cladding on one or both sides.

Grade FR-1 has a phenolic resin binder. It is well suited for many electrical applications and is available in sheets and strips.

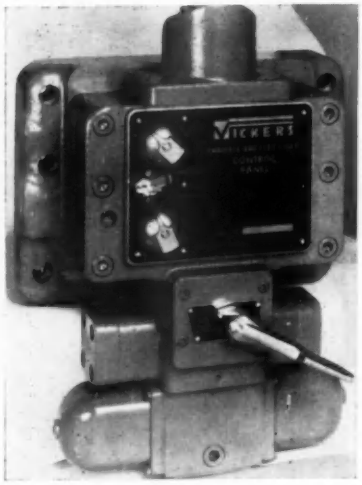
Grade EP-22 has excellent electrical characteristics, plus flame-retardant qualities. It has an Alpha paper filler impregnated with epoxy resin. *Synthane Corp. Booth 415.*

Circle 280 on postcard for more data

Cycle Control Panel

Smooth, constant feed rates and work cycles (regardless of cutting resistance or variations in oil pressure and temperature) are provided with this traverse and feed cycle control panel, to be displayed in the Vickers booth.

New components and redesigned features include temperature and pressure compensated flow control components and an improved detent which permits maximum freedom of spool movement. A reducing valve



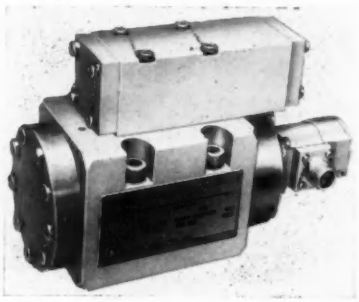
and a check valve have also been integrated into the unit to assure smooth shifting. The panel is compact and is available with various mounting arrangements. Adjustment valves are tamper-proof, being controlled by a single lock. *Vickers, Inc. Booth 1428, 1432.*

Circle 281 on postcard for more data

Electro-Hydraulic Valve

Principles used in the most precise and powerful automatic control systems will be demonstrated by a working model structual testing system in the Sanders booth.

The Model 324 electro-hydraulic servo valve represents the heart of the industrial control system to be shown, also a complete line of servo valves in ranges of 0-5 to 0-200 gpm at 1000 psi pressure drop will be dis-



placed. The valves, which convert low-power electrical control signals to powerful hydraulic forces, are said to offer high frequency response and reliability in service. *Sanders Associates, Inc. Booth 89, 97.*

Circle 282 on postcard for more data

Industrial Abrasive Unit

S. S. White Industrial Division is featuring an industrial Airbrasive unit, the Duplex Model D, and application of flexible shafts and plastic protectors.

The basic Duplex instrument consists of a controlled stream of gas-propelled abrasive which will cut or abrade, as needed, almost any hard, brittle material. It compactly combines two units in one housing.

Another highlight of the White exhibit will be a Ford Fairlane 500 Skyliner with retractable hardtop run by flexible shafts. A working exhibit of plastic plugs and caps for protecting exposed threads, sealing in lubrication, and preventing dust or dirt penetration in machinery, will also be shown. *Booth 1442.*

Circle 283 on postcard for more data

(*Turn to page* 82, *please*)

Torrington Needle Bearings are available for shafts up to 7¼" in diameter. Full complement of rollers provides highest radial capacity for a given cross section. They offer low unit cost, compactness and light weight and long service life. They take a press fit in a simple straight-bore housing, run directly on hardened shafts, permitting use of larger and stiffer shafts.

Why not put a Torrington Needle Bearing on that large shaft?

You have everything to gain by applying a large diameter Torrington Needle Bearing in your heavy duty applications.

There's the unusual economy in price and installation cost over other anti-friction bearings of comparable size. Simplicity of design of related components saves even more. Unequaled capacity for a given cross section, good lubrication and efficient anti-friction operation mean long service life.

These advantages have been proved in performance in tractor bolsters, transmissions and final drives. In haybaler crank shafts. In power shovels. In heavy duty hydraulic pumps and starting motors. In road wheel arms on tanks. Why not talk over *your* application with your Torrington representative? **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

Visit Torrington Design Engineering Show Philadelphia, May 25-28

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

What's NEW at the DESIGN ENGINEERING SHOW

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Fastener Products

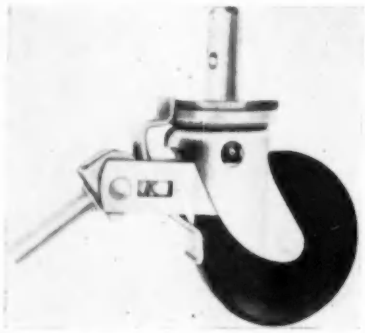
The Shakeproof exhibit will have as its focal point, a slow-moving, hopper-fed belt carrying an extremely wide selection of fastening products. Among these products will be, dished and conical washer keps (pre-assembled nut and washer) for use in spanning large clearance holes, finishing head screws (one piece combination head and finishing washer) for fastening cloth and wood without tearing or slivering, and a fastener for fastening fiberglass-reinforced plastic seats to chair frames and other products. *Shakeproof Div. of Illinois Tool Works. Booth 718.*

Circle 284 on postcard for more data

Double Lock Casters

A series of double-lock scaffold casters that assure safe handling for mobile equipment will be featured in the exhibit of the *Faultless Caster Corp.* These are medium-duty casters with load capacities of 175 to 500 pounds each.

Identified as the CL900 series, they have a simultaneous locking device that permits both rolling and swiveling. The all-steel dual-action brake can be operated by foot or hand. It locks instantly and solidly. *Booth 1052.*

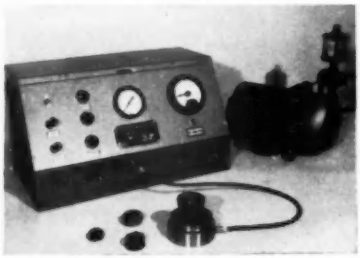


Circle 285 on postcard for more data

Vacuum Tester

The Chicago-Allis seal tester, which is an electro-mechanical device which senses small vacuum drops and compares them to a time gradient, may be seen in the Chicago-Allis exhibit.

Its circuitry forms a tank which maintains the desired amount of vacuum. A vacuum drop in this tank greater than the allowable drop calibrated into its circuitry during a given period of time will cause the actuation of relays, indicating on the control panel a rejected part. A vacuum drop less than the allowable figure will indicate on the control board an acceptable part. *Chicago-Allis Mfg. Corp. Booth 401.*



Circle 286 on postcard for more data

Compressed Asbestos Sheet

The Raybestos booth will feature a new compressed asbestos sheet called R/M A-56. It is made commercially in a thickness of 0.008 ± 0.001 in. All fibre in this sheet is spinning grade long asbestos fibre. The binder used is a heat resistant, non-reverting, synthetic compound. Average tensile strength is 8000 psi.

It has found application on supercharged Diesel engines as exhaust gaskets in the supercharger assembly and has been performing satisfactorily at flange temperatures 900 to 1100°F where exhaust temperature is 1400°F. *Raybestos-Manhattan, Inc. Booth 1553, 1555.*

Circle 287 on postcard for more data

Bearings, Metal Products

The Torrington Co. will incorporate several product divisions in its exhibit.

The Bearing division will feature the heavy duty roller bearing interchangeable with the HD needle bearing, also the self-aligning ball bushing for linkage and lever application.

The Specialties division will show precision metal parts produced to customer's specifications.

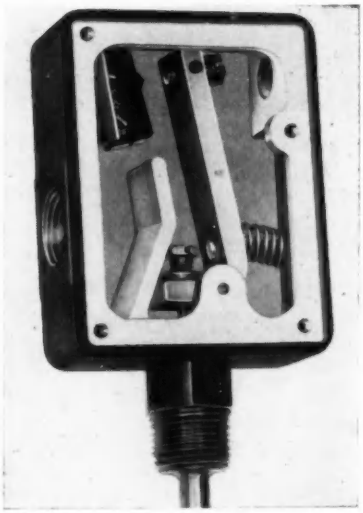
Torrington's Swaging division will demonstrate its rotary swaging unit for chipless metalworking on tubular or solid stock. And the Progressive manufacturing division will exhibit small parts made by heading. *Booth 1329, 1333.*

Circle 288 on postcard for more data

Rugged Thermostat

The model M-16 thermostat will be featured in the Burling display. It is a rugged compact unit designed for installations where space is at a premium. The basic instrument has a range of 100 to 600 F, but other ranges up to 1000 F are available. The cast aluminum weatherproof case is the size of a pack of regular cigarettes, and the differential expansion tube assembly is of stainless steel.

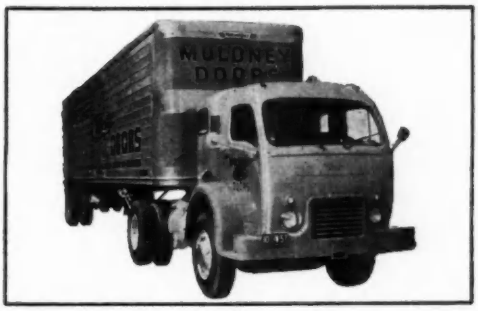
Temperature settings are made with the internal adjusting screw. The standard switch rating is 5 amp 125-250 v ac, 3 amp 30 v dc. Units are for local mountings and may be furnished with flanged or threaded fittings. *Burling Instrument Co. Booth 1637.*



Circle 289 on postcard for more data

(*Turn to page* 150, *please*)

What to do when the BUBBLE BREAKS



Trucks, buses, trailers, tractors, off highway equipment, and private motor cars of almost every prominent make use Burton Leaf or Coil springs as original equipment.

When you want reliability ...dependability...specify Steel Springs. Come to Burton to get them!

It all looks very pretty . . . then POW . . . those plans that looked so good on paper turn out worse than worthless when they're on the road. That's why correct engineering is so important in the automotive industry.

For many years, Burton Spring engineers have made a specialty of translating engineering ideas into the sound reality of tempered steel. Steel Springs not only offer a time-tested way to absorb road shocks, but they possess inherent structural qualities that make for stability and endurance in the entire vehicle. They not only soften and control vertical motion, but efficiently control lateral and longitudinal "play," side sway and rocking.

BURTON AUTO SPRING CORP.

. . . Vital Support for the Automotive Industry . . .

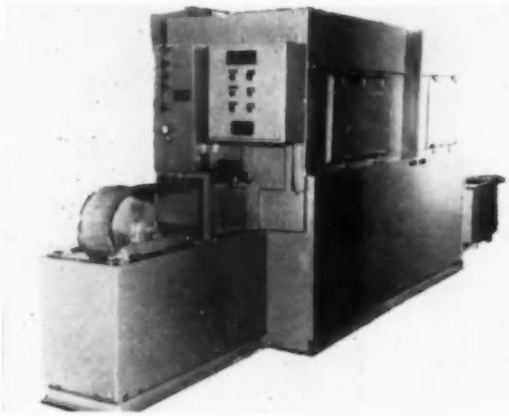
WESTERN AVENUE AT FORTY-EIGHTH STREET • CHICAGO 32, ILLINOIS

Circle 142 on Inquiry Card, for more data

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Automatic Wet-Blast De-Flashing & De-Burring Machine



This machine, designed for automatic removal of light flash and burrs from die-cast name plates and other similar parts, features stainless steel construction and no pumps or moving parts in its blast circuit. The wet-blast unit incorporates a complete process cycle including automatic un-load and oxidation-inhibition in its final stage. (Hydra-Blast Div., Automation Services, Inc.)

Circle 43 on postcard for more data

Linde Oxweld CM-60 fully automated flame cutting machine reproduces metal parts from pencil sketches

Machine Reproduces Metal Parts From Pencil Sketches

METAL parts can be reproduced from simple pencil sketches on ordinary paper with a fully automated flame cutting machine designated the Oxweld CM-60.

The machine can flame cut parts of any length, width or thickness. Standard models may be equipped with 10 torches to cut widths of 10 ft. and the thickness of the metal to be cut is limited only by the capacity of the torches used.

All cutting operations are controlled by a single operator sitting at an easy-to-use control panel. Tracing, ignition, preheat, cutting oxygen, height adjustment of the torches, movement of the carriages and positioning of the tracer can be handled from the control panel. Individual motors in each cutting torch holder provide independent vertical control of each torch. *Linde Co., Div. of Union Carbide Corp.*

Circle 44 on postcard for more data

Tool Holders

THIS tool holder is for precision screw-on type Kendex inserts. It is available in four standard sizes for each of three insert styles. They enable indexing screw-on inserts to within plus or minus 0.001 in. *Kennemetal Inc.*

Kennemetal tool holder for precision screw-on type Kendex inserts. Typical applications include small boring bars and automatic tooling for small parts on which the design or size of standard clamped type Kendex tools limits their use.

Circle 45 on postcard for more data

New Boring Cutters

INCREASED cutting feeds, long tool life and fine surface finish are said to be possible with the form-relief line of boring cutters, both high speed and carbide-tipped offered by *Maxwell Industries, Inc.*

The cutters feature an advanced spiral relief design that tends to make the chip curl and break up easily, flushing out along the shank of the tool. Especially adapted for internal work, they provide a constant clearance angle throughout the life of the tool.

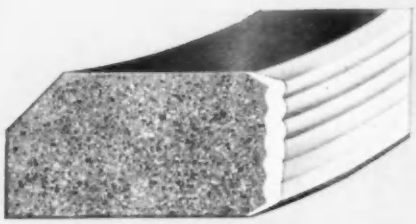
Circle 46 on postcard for more data

(*Turn to page* 148, *please*)

Circle 143 on Inquiry Card, for more data

PONTIAC KROMEX PISTON RING SETS*

Engineered especially for Pontiacs



Chrome where it counts. Heavy chrome plate on top compression rings is factory-lapped for fast break-in.

FAST BREAK-IN

INSTANT OIL CONTROL

FULL POWER

LONG LIFE

Chrome rails on the oil ring are also pre-seated at the factory for instant seating, low friction, maximum oil economy and long life.

For top results in Pontiacs, install Pontiac KromeX ring sets. Available from Pontiac dealers everywhere.

FACTORY Parts ENGINEERED

**Manufactured by Sealed Power Corporation, Muskegon, Michigan*

• • INDUSTRY STATISTICS • •

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending May 2	Weeks Ending April 25	Year to Date 1959	Year to Date 1958
PASSENGER CAR PRODUCTION				
Total—American Motors	8,923	9,436	143,036	57,653
Chrysler	1,933	2,010	28,394	20,662
De Soto	1,275	1,358	21,486	13,652
Dodge	4,531	4,725	64,558	36,512
Imperial	530	530	8,500	6,035
Plymouth	12,344	13,349	157,907	138,485
Total—Chrysler Corp.	20,613	21,972	280,845	215,346
Edsel	731	960	17,884	5,528
Ford	32,282	32,426	547,520	366,106
Lincoln	626	724	12,021	11,788
Mercury	3,295	3,270	57,921	42,755
Total—Ford Motor Co.	36,934	37,380	635,346	426,177
Buick	2,329	4,477	106,499	100,115
Cadillac	3,396	3,361	61,897	53,856
Chevrolet	31,987	34,308	599,860	498,426
Oldsmobile	5,235	9,026	153,351	130,443
Pontiac	5,529	10,902	158,194	90,888
Total—General Motors Corp.	48,476	62,074	1,079,601	873,730
Total—Studebaker-Packard Corp.	3,078	3,143	65,518	12,893*
Checker Cab	129	154	1,948	1,431
Total—Passenger Cars	118,153	134,159	2,206,294	1,587,230
TRUCK AND BUS PRODUCTION				
Chevrolet	8,581	9,003	140,860	103,101
G. M. C.	1,960	1,873	31,313	22,409
Diamond T	126	127	2,284	1,906
Divco	80	80	1,284	1,044
Dodge and Fargo	1,690	1,771	30,268	19,064
Ford	6,936	7,302	115,250	79,845
F. W. D.	11	12	332	519
International	3,322	3,305	48,306	36,620
Mack	331	375	5,989	5,310
Studebaker	212	224	5,257	4,002
White	389	441	6,577	6,392
Willys	2,147	2,410	40,302	28,229
Other Trucks	70	65	1,123	1,086
Total—Trucks	25,855	26,968	429,145	309,527
Buses	60	95	871	1,331
Total—Motor Vehicles	144,068	161,242	2,636,310	1,898,088

* Includes Packard.

1959 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	February	Two Months 1959	Two Months 1958
Vans			
Insulated and refrigerated	383	699	435
Steel	48	73	44
Aluminum	335	626	391
Semi-insulated	69	109	107
Steel	69	109	107
Aluminum			
Furniture	88	184	202
Steel	77	146	202
Aluminum	11	38	
All other closed top	2,036	4,187	2,549
Steel	561	1,175	996
Aluminum	1,475	3,012	1,553
Open-top	165	323	336
Steel	85	139	156
Aluminum	80	184	180
Total—Vans	2,741	5,502	3,629
Tanks			
Non- and low pressure			
Petroleum			
Carbon and alloy steel	196	394	336
Stainless steel	20	41	42
Aluminum	111	242	196
Total—Petroleum	327	677	574
Chemical, food, fluid solids	35	66	110
All other, incl. aircraft refuelers	101	159	20
High Pressure (LPG, chemicals, etc.)	34	85	53
Total—Tanks	497	987	757
Pole, pipe and logging			
Single axle	32	56	51
Tandem axle	57	99	66
Total	89	155	117
Platforms			
Racks, livestock and stake	38	61	253
Grain bodies, all types	142	260	101
Platforms (flats), all types	771	1,423	722
Total—Platforms	949	1,744	1,076
Low-bed heavy haulers	203	355	301
Dump trailers	140	293	185
All other trailers	272	456	279
Total—Complete Trailers	4,891	9,492	6,344
Trailer chassis[1]	442	772	538
Total—Trailers and Chassis	5,333	10,264	6,882

[1] Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS

Zone	Region	February 1959	January 1959	February 1958	Two Months 1959	Two Months 1958	Per Cent Change Feb. over January	Feb. over Feb. 1958	Two Months 1959 over 1958
1	New England	14,985	17,662	15,043	32,647	32,471	−15.16	− .39	+ .54
2	Middle Atlantic	70,204	73,241	54,302	143,445	125,705	− 4.15	+29.28	+14.11
3	South Atlantic	56,909	62,743	41,800	119,652	95,373	− 9.30	+36.15	+25.46
4	East North Central	109,030	93,449	78,147	202,479	166,572	+16.67	+39.52	+21.56
5	East South Central	20,073	19,665	16,432	39,738	32,503	+ 2.07	+22.16	+22.26
6	West North Central	37,818	38,687	32,626	76,505	66,758	− 2.25	+15.92	+14.60
7	West South Central	42,549	38,861	37,793	81,410	78,310	+ 9.49	+12.58	+ 3.96
8	Mountain	16,869	16,401	13,657	33,270	27,709	+ 2.85	+23.52	+20.07
9	Pacific	55,356	58,803	44,018	114,159	90,657	− 5.86	+25.76	+25.92
	Total—United States	423,793	419,512	333,818	843,305	716,058	+ 1.02	+26.95	+17.77

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., Ore., Wash.

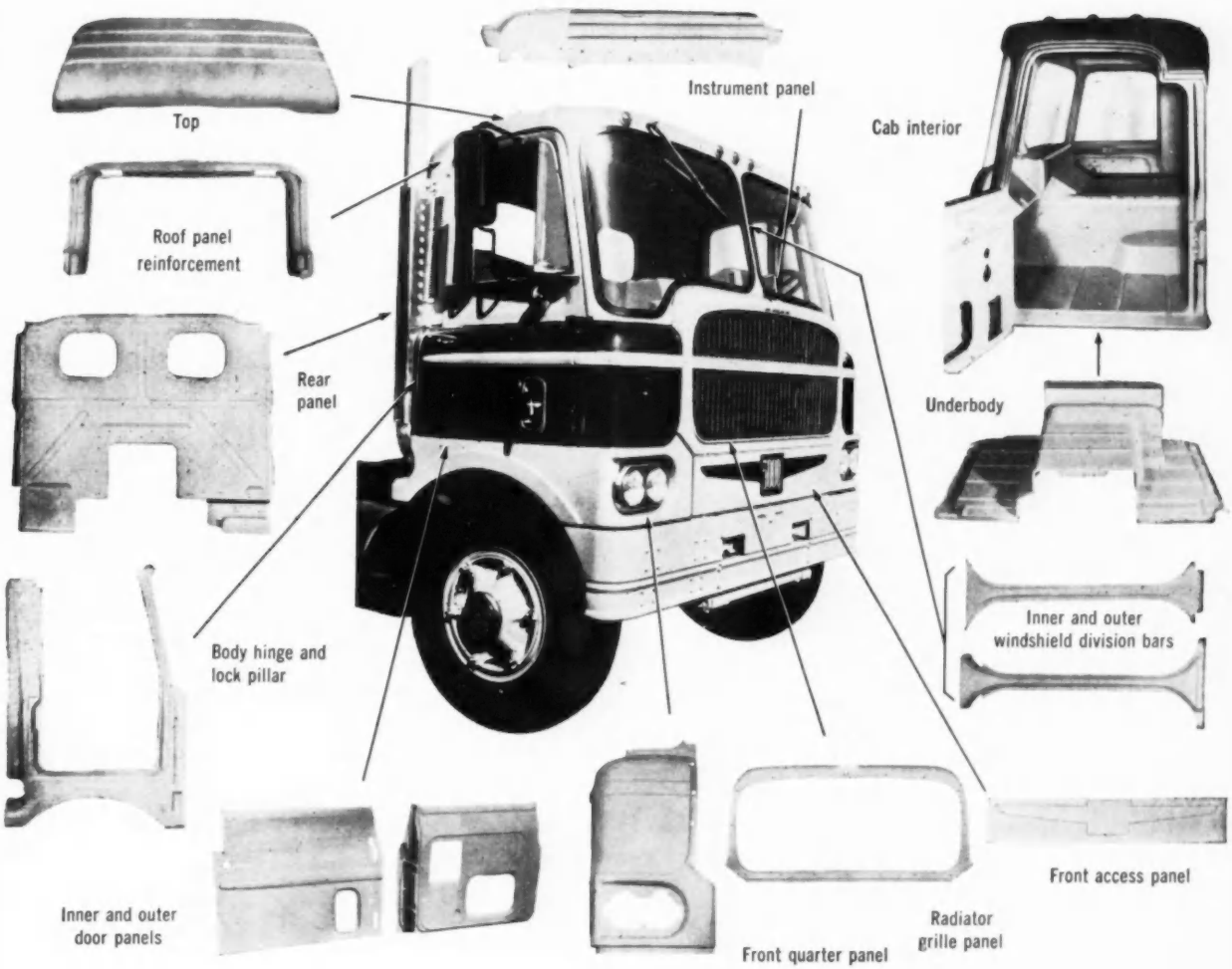
1959 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	33,000 lb. and over	Total
January	52,370	14,835	1,190	8,302	9,931	4,297	2,761	2,358	96,044
February	51,593	14,862	1,314	8,536	11,474	5,599	3,377	3,418	99,973
March	55,943	17,099	1,411	9,019	13,728	5,910	4,220	4,025	111,355
Total—Three Months—1959	159,906	46,796	3,915	25,857	35,133	15,806	10,358	9,801	307,372
Total—Three Months—1958	111,337	32,659	3,507	22,913	24,982	13,679	8,674	67,21	224,472

HERE'S HOW MOLDED FIBER GLASS makes the revolutionary new White "5000" cab

Thirty-six MOLDED FIBER GLASS parts are bonded together into an integral unit of radical new design (possible only with MOLDED FIBER GLASS) . . . space-saving, efficient, lightweight, profit-earning.



This MOLDED FIBER GLASS cab is warm in winter, cool in summer, quiet . . . rust-proof, impervious to salt and road chemicals . . . tough, impact-resistant.

Dimensions and weights are as follows:

	Dimensions front to rear	Weight
White "5000" cab	50"	260 lbs.
White "5000" sleeper cab	81"	340 lbs.

Write or phone today for cost estimates on making *your* products *better* with MOLDED FIBER GLASS, as matched-metal-die-molded by the world's largest, most experienced producers of fiberglass reinforced plastic.

MOLDED FIBER GLASS BODY COMPANY 4611 Benefit Avenue, Ashtabula, Ohio

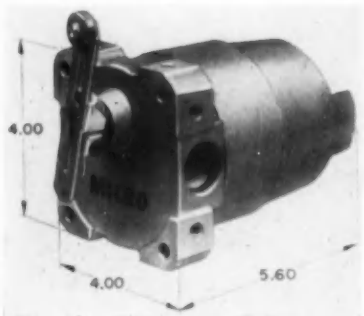
NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Explosion-Proof Switch

An enclosed switch which is rain-tight and explosion-proof has been introduced by *Micro-Switch, Div. of Minneapolis-Honeywell Regulator Co.*

Named the 2CX3, the switch has an aluminum die-cast housing and dome cover. It is designed for use on fuel



handling equipment, rocket and missile launching devices, industrial valve control systems and other hazardous outdoor applications.

Electrical capacity is UL listed at 20 amp, 125, 250 or 460 vac. The arm is field adjustable through 360 degrees and from 1 to 3½ in. in length. Contact arrangement consists of two-pole, double-throw replaceable switching units. The roller arm is moved clockwise to actuate one unit and counter-clockwise to actuate the other unit.

Circle 31 on postcard for more data

Thermoplastic Polymer

"Delrin" is a highly crystalline, high-melting thermoplastic polymer, known chemically as a linear acetal resin or as polyoxymethylene. Its strength properties approach those of the non-ferrous metals and it will do many jobs hertofore performed only by metals.

"Delrin" is extremely rigid without being brittle. It is both tough and resilient, much like spring steel and it retains these properties under adverse conditions of temperature and humidity during an extended time under stress and during exposure to most solvents. It is tasteless, odorless, and non-toxic.

The material can be fabricated by conventional methods on standard plastics processing equipment at mass production rates. It can be screwed, nailed, sawed, drilled, machined, painted, metalized, printed, etc.

Potential applications include areas now dominated by die-cast metals. Among uses tested are automobile instrument clusters, carburetor parts, gears, bearings and bushings, door handles and window cranks, etc. *E. I. Du Pont de Nemours & Co.*

Circle 32 on postcard for more data

Compact Differential

Warner Automotive Div. of Borg-Warner Corp. has announced the development of a small, compact differential adaptable to many small-vehicle applications.

Rated at 10 hp, the unit is designed for automobiles, small delivery vehi-

cles, and for miscellaneous differential requirements.

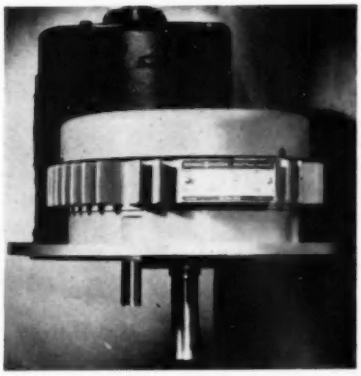
The assembly, named WA 79, has provisions for mounting sprockets, pulleys or gears. Hubs are also provided for anti-friction bearings. It is equipped with an Alemite grease fitting for lubrication when mounted externally and can also be run in oil inside a differential case.

Circle 33 on postcard for more data

Thinline Motor

A thinline motor, designed for such applications as machine tools, fans and blowers, has been designed by *General Electric's Small Integral Motor Dept.*

The thinline principal reduces motor overhang and makes the motor easy to install on original equipment. It can be mounted in either horizontal or vertical position and is available in polyphase drip-proof and enclosed

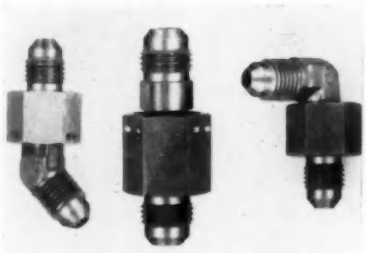


construction from 1 to 5 hp at 1800 rpm.

Circle 34 on postcard for more data

Self-Alignment Swivel

This rotating joint features a 14 degree misalignment allowable, in addition to a 360 degree rotation. Designed for the aviation and missile industry, as well as commercial applications, it offers a small, lightweight, inexpensive solution for rotating or oscillating hydraulic or pneumatic line problems. It can be obtained in various configurations, such as straight-through for insertion



in a linear pipe line, ell for 45 degrees, right angle, tee, cross, or any other angle. *Dumont Aviation Associates.*

Circle 35 on postcard for more data

Machine Tool Switch

Loxswitch, Model M, a small heavy duty switch, incorporates an advanced low-mass, low-friction design. The unit measures 1-7/16 in. in width and 3-⅞ in. in length and is designed

with all major friction points of either nylon or oil impregnated bearings.

It has a full 600 v industrial rating, extra wide contact gaps, and all contact bars are of heavy coin silver. *R. B. Denison Mfg. Co.*

Circle 36 on postcard for more data

Rotary Torque Actuator

An improved rotary torque actuator design incorporates full cushioning as standard in providing 0 to 370 degrees of high torque rotation. Powered by air, gas, water or oil, it seals dead tight and will not back off under tension, shock, vibration, or complete power failure.

The full cushioning provides smooth, controlled deceleration at the end of either the clockwise or counter-clockwise rotation cycle. This, plus an extra five degrees at the end of either cycle, provides freedom to use full quadrants of rotation in all standard rotation cycles. Applications include positioning of all kinds, indexing, cam actions, valve operations, swing motions, transfer mechanism, and maintaining constant tension. *Carter Controls, Inc.*

Circle 37 on postcard for more data

One-Piece Speed Clip

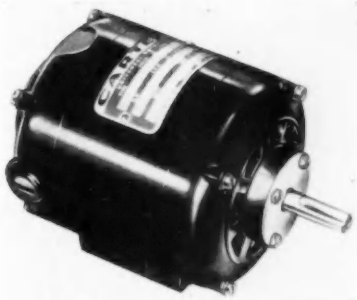
Designed to secure small-diameter armored control cables on electrical equipment, automobiles, etc., the Tinnerman one-piece cable speed clip offers positive vibration-proof fastening at any location along the cable and unlimited reuse without damage to cable or clip.

To assemble, a small L-shaped tab on the clip is inserted into a panel hole provided. The armored cable is then positioned between an embossed groove on the panel and a mating groove in the clip. A sheared spring arm with turned down tabs extending from the center portion of the fastener grips the spiral turns of the cable to prevent it from moving out of adjustment. *Tinnerman Products, Inc.*

Circle 38 on postcard for more data

Universal Motor

A fractional hp universal motor has been developed by *Carter Motor Co.* It is made in eight standard models operating at 3600, 5000, 7500,



or 10,000 rpm. Horsepower ratings are 1/10, 1/12, 1/15, 1/18, 1/20, 1/25, or 1/35 hp. It is available as universal, shunt or series from 12 v to 220 v input.

Circle 39 on postcard for more data

Fuel Filter

A fuel filter with positive supermicronic filtration that prevents stalling, hard starting, rough idling and fuel waste has been designed by *Purolator Products, Inc.*

Known as the GF-11 fuel filter, the device can replace any other unit. The pleated construction of the resin-impregnated cellulose filtering element makes it possible to provide nearly 50 sq-in. of filtering surface within the compact, sturdy metal case and still have ample dirt retention space.

The filter can be installed either horizontally or vertically at any point where there is six inches or more of straight tubing. Hose connections fit 5/16 in. OD tubing but can be stretched over ⅜ in. OD tubing if necessary.

Circle 40 on postcard for more data

Miniaturized Switch

Overall dimensions of a new push-button switch measure ¾ in. in diam-

eter and 1½ in. high. A combination of an "O" ring in the stem containing the push button plunger and potting around the leads seals out dirt, moisture, and oil.

The stem is threaded for mounting in ½ in. holes and has an electrical capacity of 6 amps at 125 v ac/ 30 v dc resistive, 2.5 amps at 30 v dc inductive. Operating force is 8½ lb, plus or minus 3 lb. *Electrosnap Corp.*

Circle 41 on postcard for more data

Electric Motor

A compact ac motor for flyaway cargo hoist application has been designed by *Western Design, Div. of U. S. Industries, Inc.* Known as the Model 693, the motor is reversible and features a quick stopping magnetic brake and torque limiting clutch. Nominal force delivered at the drive shaft is 5 in-lb at 7200 rpm. Starting torque is better than 10 in-lb. The duty cycle is 3 minutes "on" and 10 minutes "off."

Circle 42 on postcard for more data

(*Turn to page* 108)

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

New Ultra - Precision Positioning Table Has Accuracy of ± 0.00025 in. for Location of Workpiece, with a Repeatability Within ± 0.00005 in.

Education Is Theme at Spring Meeting of NMTBA

Improvement Continues In Machine Tool Sales

Net new orders for cutting-type machine tools amounted to about $40 million in March, up 11 per cent over February's $35.95 million and 36 per cent above March, 1958's sales of $29.45 million.

Orders for forming-type machines totaled $10.55 million in March, 12 per cent over February's $9.45 million and 58 per cent over the March, 1958, bookings of $6.7 million.

First Quarter, 1959 net new orders for both types of machines totaled $137 million, versus last year's 1st Quarter sales of $91.3 million, for an overall increase of 50 per cent.

Shipments of cutting and forming type machines during the first three months of this year amounted to $113 million, while last year's equivalent-period figure was $160 million.

Machine Tool Builder Shows Precision Table

At a recent press conference in Cincinnati, The American Tool Works Co. put on a series of impressive demonstrations with the unveiling of an ultra - precision positioning table. According to company engineers, this unit can position work operations with an accuracy of ±0.00025 in. on either axis, with a repeatability within ±0.00005 in., and do it when installed in the normal shop. It is, of course, numerically-controlled, using punched tape.

The table weighs 8000 lb, and has a working area of 30 by 20 in. Workpieces are located on the table by means of stop plates installed at the edges of the table plus blocks having lengths prescribed by the tape processor. The table and saddle travel on hardened and ground Timken graphitic tool steel ways, each set of which consists of one flat and one vee way. Table travel and holding in work position are handled hydraulically, without the use of screws, nuts or mechanical clamps.

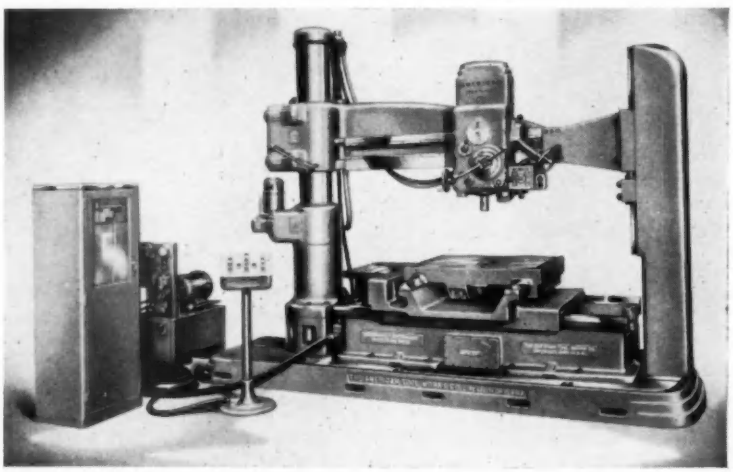
The control system was developed by Sperry Gyroscope Co. of Canada. It employs the use of standard one-inch wide, eight-channel, Mylar - laminated paper tape. The tape can be processed on a manual punch, as well as on a Frieden "Add-Punch" that provides a typed record for checking-out purposes.

Each position on the tape contains the x and y axes plus instructions such as "tool change." There are no memory circuits, the tape traveling from position to position as the work cycle progresses under manual pushbutton control. The tape is read pneumatically by flow of low pressure air. This air, passing through the holes in the tape, actuates a selected series of switches, signalling the electronic control system and in turn the machine's hydraulic system.

Feedback signals are supplied by two Farrand electronic scales —one each on the x and y coordinates—contained in the sealed housings of the table. Each scale is made of glass with embossed wiring, and is read by a slider 0.005 in. away from the scale surface.

During the demonstration the new positioning table was used with one of American Tool Works' new "Hole Wizard" radial drills. Drilling, boring, reaming, and tapping operations were performed on steel plates and a cast gear case.

(*Turn to page* 128, *please*)



New tape-controlled positioning table, developed by The American Tool Works Co., is shown installed on the base of an American "Hole Wizard" radial drill. It was designed for heavy-duty drilling and boring work requiring precision hole spacing. Outboard arm housing of radial drill was provided for added rigidity.

IT'S NEW

IT'S A PUSH-IN NUT

light finger pressure seats it for good!

PATENT PENDING

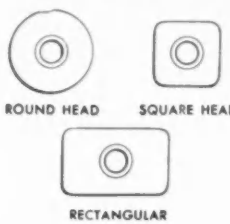


TABLE OF DIMENSIONS

For use with #8 or #10 screws, finished hole size .290/.281, application thickness .030/.060. Other sizes available soon.

HEAD SIZE	HEAD HEIGHT
7/16" DIA.	.150
1/2" DIA.	.030
1/2" DIA.	.040
1/2" DIA.	.070
1/2" DIA.	.150
1/2" DIA.	.100
3/8" SQ.	.040
3/8" SQ.	.140
13/32" SQ.	.030
13/32" SQ.	.200
3/8" x 37/64"	.060

This new Dot Nylon Push-in Nut offers additional design and performance advantages over our currently available plastic snap-in nuts. These advantages are:

(1) Straight legs permit easy insertion in square, punched holes and do not distort the holes even in soft aluminum or thin-gauge steel. (2) Burrs do not impede the nut or prevent proper seating. (3) Tapered screw hole causes legs to spread when screw is inserted and results in greatly increased pull-out resistance (see drawing A).

Ordinary sheet metal screws cut clean, strong threads in the molded nylon and the nut is both re-usable and highly resistant to vibration.

Used as a nut or as a spacer, Dot's Nylon Push-in Nut has wide application in all products where sheet metals or plastics are employed. They can be supplied with a moisture resistant sealer and special nuts can be designed to your specifications if volume warrants. Currently available in eleven sizes. Full information on request.

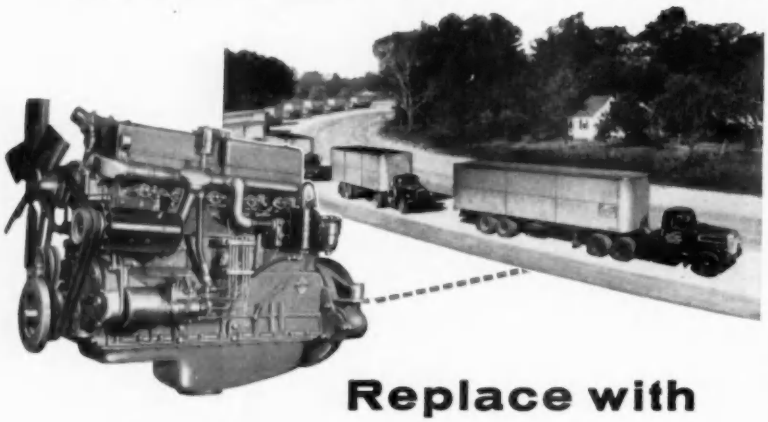
CARR FASTENER COMPANY

Division of United-Carr Fastener Corp., Cambridge 42, Mass.

MAKERS OF DOT FASTENERS

Booth #1026 — Design Engineering Show

FOR LOWER TON-MILE COSTS



Replace with *DEPENDABLE* CONTINENTAL RED SEAL POWER

In highway hauling, as elsewhere, profit margins continue to shrink, and wise choice of rolling stock becomes more essential than ever. That is why more and more truckers are replacing original equipment engines with rugged Continentals, engineered expressly for the job. Choose from the models listed below. See your distributor today.

RED SEAL TRANSPORTATION ENGINES

GASOLINE

Model	Cyl.	Displ.	Bare Engine H.P.
N4062	4	62	26.3 @ 3500 RPM
Y4069	4	69	28.0 @ 3400 RPM
Y4091	4	91	36.0 @ 3400 RPM
F4124	4	124	47.0 @ 3200 RPM
F4140	4	140	52.0 @ 3200 RPM
F4162	4	162	58.0 @ 3200 RPM
F6186	6	186	77.0 @ 3500 RPM
F6209	6	209	90.0 @ 3500 RPM
F6226	6	226	98.8 @ 3500 RPM
F6244	6	244	103.3 @ 3500 RPM
M6271	6	271	96.5 @ 3000 RPM
M6290	6	290	108.0 @ 3000 RPM
M6330	6	330	125.0 @ 3000 RPM
M6363	6	363	146.0 @ 3000 RPM
B6371	6	371	123.5 @ 3000 RPM
B6427	6	427	142.0 @ 3000 RPM
FO6226	6	226	126.2 @ 3400 RPM
K6271	6	271	114.5 @ 3200 RPM
K6290	6	290	123.0 @ 3200 RPM
K6330	6	330	147.0 @ 3200 RPM
K6363	6	363	162.0 @ 3200 RPM
T6371	6	371	143.8 @ 3000 RPM
T6427	6	427	170.0 @ 3000 RPM
U6501	6	501	186.0 @ 2600 RPM
R6513	6	513	192.2 @ 2800 RPM
R6572	6	572	220.0 @ 2800 RPM
R6602	6	602	232.0 @ 2800 RPM
S6749	6	749	250.0 @ 2800 RPM
S6820	6	820	300.0 @ 2800 RPM
V8603	8	603	260.0 @ 3200 RPM

CUSHIONED POWER DIESEL

Model	Cyl.	Displ.	Bare Engine H.P.
TD6427	6	427	146.5 @ 2600 RPM
RD6572	6	572	172.0 @ 2400 RPM
VD8603	8	603	200.0 @ 2800 RPM
SD6802	6	802	225.0 @ 2200 RPM

PARTS AND SERVICE EVERYWHERE

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SHORTIES

One steel company is building a plant in which high temperature alloys will be fabricated in an inert atmosphere, requiring plant workers to wear specially designed space suits.

•

The aircraft and missile industry employs about 67 per cent of its total force of about 85,000 scientists and engineers in research and development projects.

•

More than 300 different firms were involved in the production of the X-15, a manned rocket-powered space research vehicle.

•

Air traffic experts estimate that by 1965 the volume of helicopter landings and takeoffs will total 30 million.

•

It took more than 2000 hours of engineering time to develop an electronic steering system for a supersonic fighter, which takes off and lands at speeds between 150 and 200 mph, is as easy to steer as the family car.

•

A transportation expert predicts an end to rail travel — if present trends continue—by the year 1970. All Pullman service, as he sees it, will end by 1965, all coach service by 1970, and commuter trains not much later.

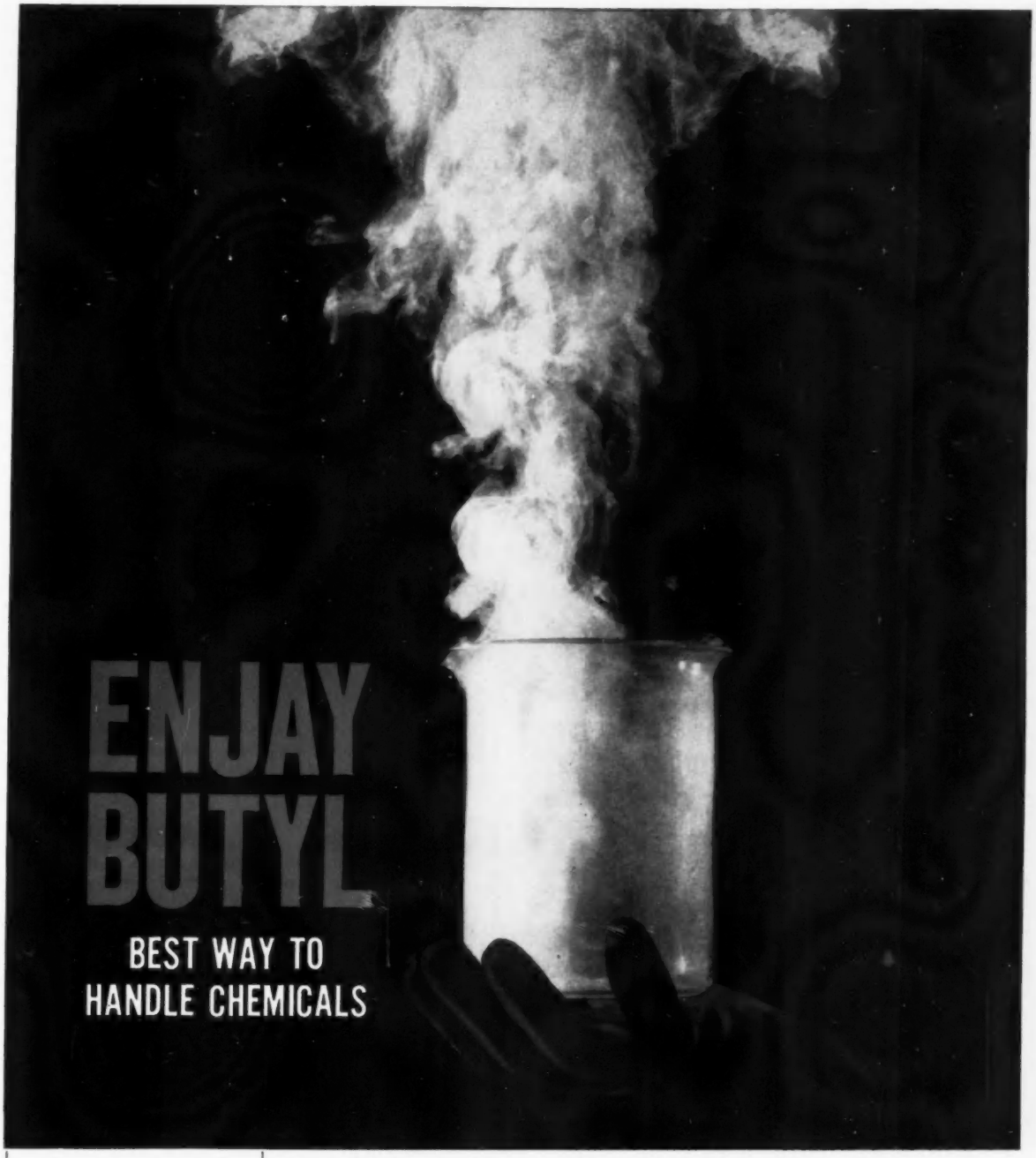
•

One leading geologist figures that the world holds 1500 billion barrels of petroleum recoverable by conventional primary methods. The U. S. share is an estimated 240 billion barrels, including cumulative oil production.

•

According to a recent study, about 35 billion gallons of gasoline, and over 1.5 billion barrels of crude petroleum, are conserved each year as a result of improved fuels and engines.

Circle 144 on Inquiry Card, for more data



Here are a few of the many chemicals that Butyl offers excellent resistance to:	
Dimethyl hydrazine	Cl Br methane
Phosphoric acid	Ozone
Sulfuric Acid	Hydrofluoric acid
Red fuming nitric acid	Ammonia
Oxygenated solvents	Molten sulfur

Enjay Butyl rubber, due to its unique and extremely low degree of unsaturation, offers excellent resistance to corrosive chemicals. Versatile Butyl is the preferred rubber for countless types of hoses, tank linings, gaskets, seals—and many other applications where exacting chemical resistance is required.

Butyl *also* offers . . . outstanding resistance to weathering, sunlight, heat, and electricity . . . abrasion tear and flexing . . . superior damping properties . . . and unmatched impermeability to gases and moisture.

Find out how this versatile rubber can improve your product. Call or write the Enjay Company, today!

ENJAY® BUTYL

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

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NOW...FROM AUTO-LITE

LIGHT, QUIET, RUGGED ADVANCE DESIGN STARTING MOTORS

NEW COST REDUCTION SERVICE FOR MANUFACTURER CUSTOMERS

Programs that include design, engineering, methods, automation and manufacturing are all contributing to the important new cost reduction service of the Electrical Products Group of Auto-Lite. Included are greatly expanded research and engineering activity, facilities for field training and servicing and District Managers prepared to assist customers and prospects in their drive for lower costs.

Here is a starting motor built to *your* design. Auto-Lite talked with engineers throughout the country before designing this motor. Then we designed in those features that you wanted most.

LIGHTNESS . . . The use of a new concept in frame construction makes this motor lighter than former designs, yet just as sturdy.

QUIETNESS . . . A shunt coil mounted with three series coils limits light load speed and improves pinion to ring gear meshing. This quiets the motor and extends gear life.

RUGGEDNESS . . . This design has survived rugged tests of heat, freezing, high impact, current overload, humidity, and dust. Long term, harsh endurance tests were run; 40,000 to 50,000 starts . . . the equivalent of 12 years or more of normal service.

Radical brush rigging minimizes arcing at the commutator and cuts current loss, due to dust grounding, to a negligible factor. And this new 12-volt model comes with either a positive shift or a Bendix drive . . . covers a wide variety of applications.

AUTO-LITE®

ELECTRICAL PRODUCTS GROUP

THE ELECTRIC AUTO-LITE COMPANY, TOLEDO 1, OHIO

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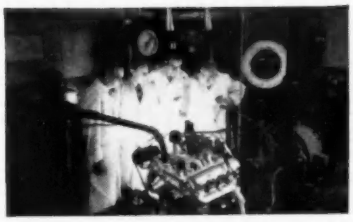
GREATLY EXPANDED RESEARCH AND ENGINEERING FACILITIES ASSIST AUTO-LITE CUSTOMERS



In 19 modern laboratories hundreds of graduate engineers and scientists, assisted by skilled laboratory technicians and draftsmen, are engaged in special projects for the military and industry.

Each individual laboratory specializes in its own area of research and engineering. Any two or more laboratories can be co-ordinated under the Director of Research in a team effort to approach a particular problem or series of problems.

Attitude of Inquiry

By maintaining a practical attitude of inquiry, Auto-Lite engineering is made vital and anticipates the needs of the many industries we serve.

Low voltage ignition, co-axial starters, cermets, ceramics, transistorized ignition have all been under development in the Auto-Lite laboratories in recent years.

How you can take advantage of this Service

As a part of the new Auto-Lite Cost Reduction Service, the Electrical Products Group District Managers are at your service. They can tell you how Auto-Lite can make available to you the skills and know-how of its 19 engineering and research laboratories, its manufacturing facilities, and its nation-wide service organization. They can help you with your cost reduction and product improvement programs.

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City & State_____

Retooled Vauxhall Plant

(*Continued from page* 72)

that can align with and drop into the pin hole from one side only.

When this occurs the rotation stops, the plunger retracts, and the jaws grip the piston, withdrawing it clear of the magazine prior to the swing of the arm to the load/unload station. This sequence is controlled by limit switches.

On the cylinder block line, five American transfer lines (two Ingersoll and three Barnes) are closely linked together to give a total of 82 stations. These are followed by a Dawson washer, an Ingersoll 7-station crank and cam borer, a special 7-station machine that presses in the cam bushings and finish-bores them and the crank bearings, an Asquith 6-spindle unit that rough-bores the cylinders, a Cincinnati horizontal tunnel broach for the pan face, and a pair of Ex-Cello-O fine borers that finish the cylinders. The entire setup is adaptable for the 6- and 4-cylinder blocks, and a changeover can be carried out in two hours.

Cylinder heads for both engines start out through a 14-station Kearney & Trecker transfer line that initially mills the six sides of the castings, using appropriate turnover and rotary fixtures. This is done to a close tolerance with a finishing pass in the case of the joint faces, since Vauxhall does not use head or manifold gaskets. Drilling, boring and reaming operations are begun on this machine, then finished on the 17-station Asquith line that follows. Finally, a 6-station Ex-Cello-O is used for fine-boring the valve areas.

Valve guides and pushrod tubes are inserted in the head on a Weatherly Oilgear horizontal press adapted as a 4-station transfer unit. Heads lying on one side are indexed through the machine, while the appropriate sets of tools are carried on the long closing ram. Guide bores are simultaneously brushed out at the first station, and the guides, having been hand-loaded on the simple positioning magazine, are pressed in at the second. The tubes, positioned in the same way, are inserted at the third station, and expanded to effect an oil seal at the fourth. ■

Cost Saving Techniques Disclosed at Annual Meeting of ASTE

(*Continued from page* 68)

on the punched paper tape and transmits the signals to the machine controls, eliminating the magnetic tape and tape playback.

If more than one numerically controlled machine will be used, it is much more economical to locate the director away from the machine, feed the input data from the punched paper tape through it, record the electrical signals generated on magnetic tape, and feed this tape into a magnetic playback unit at the machine.

Simplified and more accurate model reproduction is possible by using a new room temperature vulcanizing silicone rubber for molds, Donald E. Dutt, Senior Engineer —Tool Development, and Robert Treat, Jr., rubber specialist, General Electric Company, told the meeting. Flexible molds are produced by painting over a master pattern with the RTV material, splitting and releasing the pattern, vulcanizing, then pouring epoxy resins or other potting resins into the molds so formed. The silicone rubber has natural high-release characteristics, resists cure temperatures as high as 600 F, and gives excellent surface and detail to the casting. ■

Expanding Uses for Powdered Metal Parts

(*Continued from page* 58)

marked C. The powder is compressed with a punch marked D, which consists of a flat pressing surface parallel to the powder surface and also a pressing surface which is angled to the powder surface. These two surfaces are faired together.

Figure 2 illustrates the sequence of events during pressing and will essentially describe the major features of the process. The punch is raised clear of the pressing area in step one and loose powder is charged into the channel formed by the die walls which are not shown here. A starting block is used to contain the loose powder fill until pressing is under way. For convenience in illustration, the loose powder fill is shown divided into a series of imaginary segments labeled A through K.

In step 2, the punch is lowered into the channel. The horizontal flat surface, which will be called the "finishing area," is adjacent to the starting block. When sufficient pressure is applied to achieve the desired degree of compaction, a study of this picture will show that, over the length of the sloping portion of the punch which is in contact with the powder, the powder has been pressed with an infinite number of pressure values from zero in a portion of segment I to the maximum pressure available under the finishing area in segments A and B.

Step 3 of this illustration shows the punch raised after the pressure stroke. The distance raised is arbitrary except that a minimum travel is necessary in order to avoid interference of the punch with the powders during the next step.

In step 4 the powder is moved as a unit a prescribed distance to the left. The significance of this step is obvious from the illustration. All the powder that was under the finishing area of the punch in step 2 has been subjected to full pressing pressure in step 2 and consequently has been compacted to its desired green density. If the powders are then moved to the left a distance less than the length of the "finishing area" of the punch, some of the fully compacted powder, in this case segment B, will still remain under the "finishing area." Since it cannot be compacted any greater amount, assuming the same or slightly less pressure is again applied, it will show no density discrepancies nor surface marks from the left or exit edge of the punch. All the powder now under the punch, however, except segment B, is in position to receive another increment of compaction during the next pressure stroke.

Step 5 is identical to step 2 expect that the punch is now compacting the powder fill slightly to the right of the previous stroke. Segment C, being under the "finishing area" of the punch, has now received full compaction. Segments D through I have received additional

More than
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DIESEL ENGINES
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VERTICALLY driven
ROOSA MASTER
fuel injection pumps
The vertical pump drive arrangement, pioneered by Hartford Machine Screw Company, is a revolutionary and exclusive ROOSA MASTER feature. The vertical adaptability has saved manufacturers thousands of tooling expense dollars by permitting standardization of engine blocks for gasoline and diesel engines.
More than 40,000 vertically driven ROOSA MASTER pumps in satisfactory field service are proving that the vertical application to existing and new engine designs is practical and sound.
VERTICAL DRIVE ADVANTAGES: • Simplicity of installation • Easy accessibility • Shorter injection lines for better performance • Lower cost • Makes available space for other accessories.
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Mosba
You can depend on the diesel that depends on ROOSA MASTER

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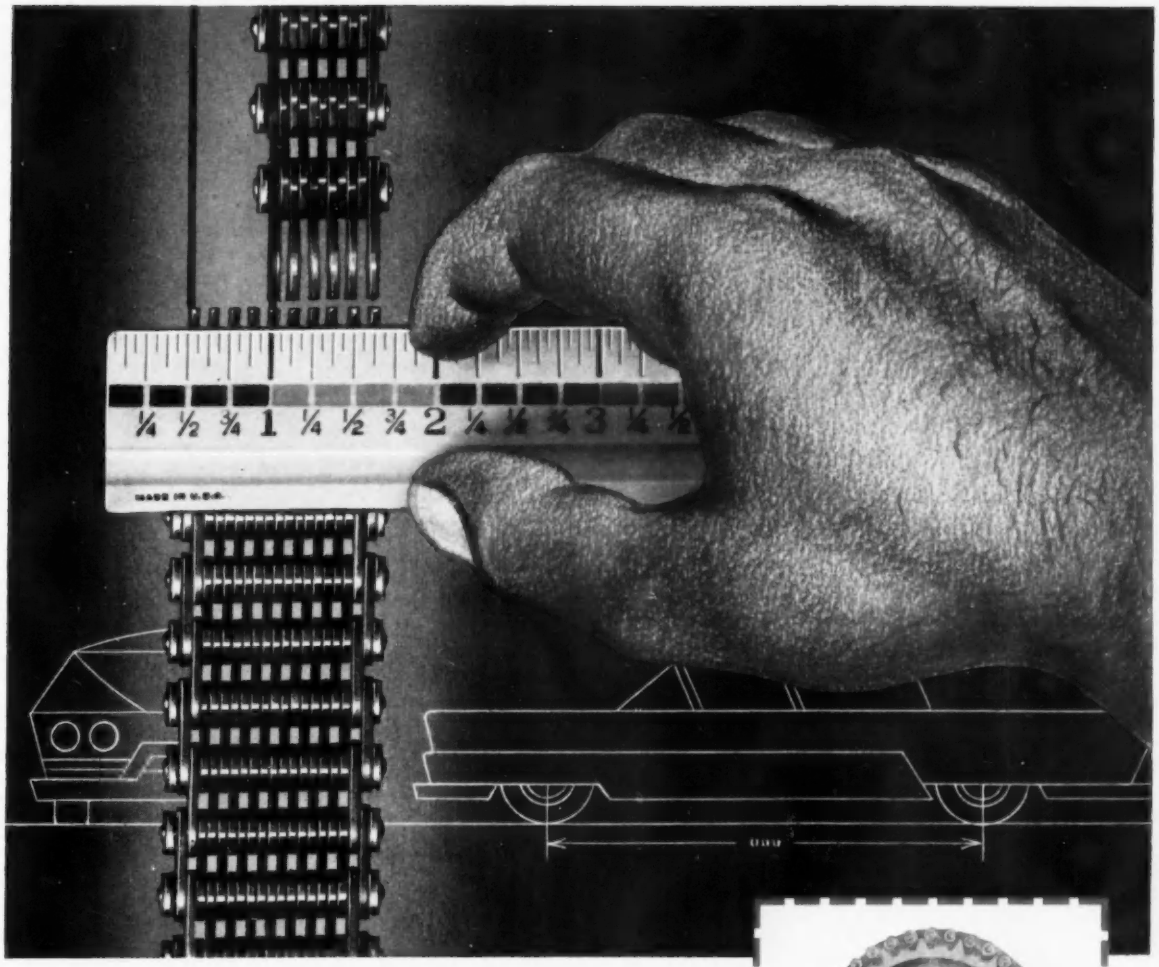
A multi-million dollar difference



Why so many leading automakers have switched to LINK-BELT's narrower timing chain

SAVING even a fraction of an inch of motor length can mean a substantial reduction in production costs. And by permitting use of narrower sprockets, shorter camshafts, crankshafts—and cutting overall length, where desired—Link-Belt 11/16-inch timing chain has brought significant economies to many car manufacturers.

Originated by Link-Belt in 1949, this narrower, ½" pitch design has been adopted by more and more leading auto makers. And the fact that it has accommodated a better-than-100% horsepower increase on some engines testifies to its exceptional durability.

For more complete information, write for Book 2065.

LINK-BELT

15,019

TIMING CHAINS AND SPROCKETS

LINK-BELT COMPANY: 220 South Belmont Ave., Indianapolis 6, Ind.

FROM FRACTIONAL TO THOUSANDS OF HP, from 3/16-in. to 2 inch pitch, Link-Belt silent chain is used to drive equipment ranging from small power tools to huge commercial electric generators. Typical is timing chain drive above—standard equipment on many of today's cars.

To get the most out of barrel finishing

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OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

Barrel finishing cuts unit-cost of deburring from 15¢ to 1¢! How much could it save you?

In one midwest plant, total cost of deburring 20,000 complex aircraft parts by barrel method came to less than $200. This compares with a former cost of $3,000 by hand methods.

This startling reduction in cost is the result of handling hundreds of pieces at a time, instead of grinding each one separately . . . and the result, too, of using the right compound to help the media and barrel do their work.

It's in selecting and supplying the right compound that Oakite helps you get the most out of barrel finishing. Oakite compounds include alkaline and acidic types . . . for steel, brass, zinc die castings, aluminum or alloy parts.

Ask your local Oakite man about barrel finishing, or write for free booklet on barrel finishing to Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.

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increments of compaction, and a portion of Segment J has received an initial increment of compaction. By repetition of this cycle, the loose powder is pressed into a continuous bar.

The method which has been described thus far in general terms can utilize an automatic setup capable of producing bars of unlimited length that can be fed directly into a sintering furnace and thence to further processing stops such as rerolling. A mechanism can be readily designed for feeding the powder onto a carrier which automatically moves it to the pressing mechanism and transports the pressed bar into the next processing stage.

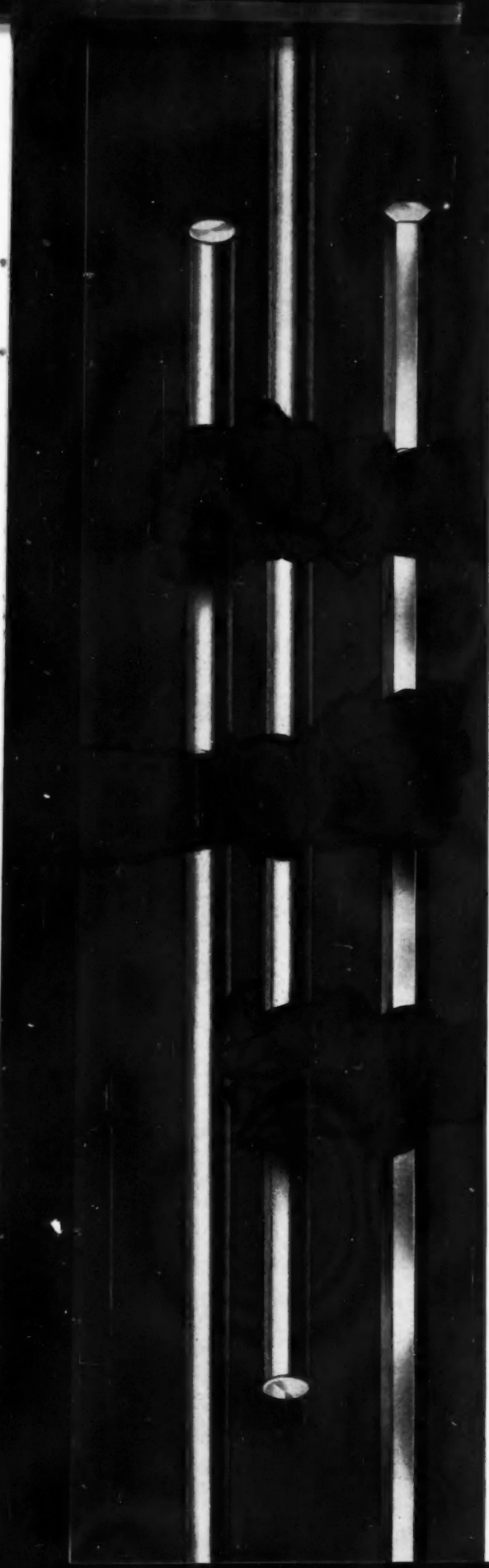
Another technical paper, presented by R. Blue, Amplex Division, Chrysler Corp., was devoted to the advancement of powder metallurgy in the automobile. Following is an extract of his paper:

We know that the automobile is constantly undergoing changes in its design and performance requirements. An accelerated search is going on for new and better materials for special applications. You hear a great deal about the ambitions of the aluminum people to increase the use of their metal in a car. Glass and plastics producers are similarly ambitious.

We have the same opportunities with powdered metal. That is how we are approaching the future at Chrysler Amplex and we feel we can conservatively forecast an increase of 100 per cent in the use of powder metal parts in automobiles in the next three to five years—at least 200 per cent increase in the next 10 years.

For example—in a typical Chrysler car today there are approximately 96 different powder metal parts—more than 6½ lb in some models. We know that we can make scores of automotive parts that have been traditionally made from other materials. Further, we know that these powder metal parts will give equal or better performance and that they can be produced at lower over-all cost. Our job is to convince automobile designers of this fact.

We have by no means exhausted the potential applications for automotive use. In addition to self-lubri-



An announcement of interest to manufacturers of steel parts

Improvements in today's STRESSPROOF® STEEL BARS WITH COPPER

1 **100,000 PSI YIELD STRENGTH** in all sizes . . . without heat treating.

2 **IMPROVED PHYSICAL PROPERTIES...** better fatigue life wearability, and resistance to atmospheric corrosion. Over-all quality is improved.

3 **IMPROVED MACHINABILITY...** STRESSPROOF with copper now machines faster and better than ever. It gives longer tool life, better finish, and more production from a day's run, according to shop production records.

4 **CLOSER TOLERANCES...** Tolerances for rounds have been tightened to meet the need for more precise parts as follows:

¼" to 1½"	Over 1½" to 2½"	Over 2½" to 3⅜"
+.000 −.004	+.000 −.005	+.000 −.006

5 **COMPARED WITH OTHER STEELS, STRESSPROOF COSTS EVEN LESS TODAY...** Also saves machining and heat treat costs, and you get a better quality part. It will pay you to take another look at this improved material.

Your STEEL SERVICE CENTER stocks contain today's STRESSPROOF. It has been produced and shipped over a several months' period.

JUST PUBLISHED! Use this coupon to request your copy of new bulletin, "Improvements in Today's STRESSPROOF Steel Bars."

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Company_____

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cating bearings we are constantly working on additional automotive transmission, engine, differential, chassis and body parts of a functional or structural nature—in fact, any part where machining operations can be eliminated by powder metal processes.

I'm sure the truth of this is apparent to most of us, but we are prone to get so wrapped up in our daily problems that we lose sight of the tremendous scope of our opportunities.

We are facing a challenge. The extent to which we meet this challenge at this time will largely determine the course we are to follow in our future development and in the increasing acceptance of powder metallurgy applications in the automobile and other products.

Probably one of our largest stumbling blocks in the past has been the fact that we have been lax to supply design engineers with sufficient engineering data relative to our products. Today we have material specifications which our design people are becoming familiar with.

All too often in the past we have supplied hand-made or laboratory samples that have proven satisfactory on test—but which, when made on a production basis, have not been true replicas of the initial samples.

In the early stages when a service failure occurred, and our customers requested information relative to the materials, we were delinquent in supplying them with adequate answers. Today we are in a much better position, but we are still paying for some of our early over selling.

Put yourself in the position of a customer who has installed powder metal parts in his product. Unsatisfactory powder metal materials and service trouble with these parts can give a bad name to his entire product, and can damage his hard-won reputation for quality.

We must know why any of our parts do not perform satisfactorily, and be prepared to take immediate corrective action, the same as in manufacture of parts produced by any other process.

We must be able to supply dependable engineering specifications on our products. We must be prepared to provide an engineering service to design and materials people that will give the required information necessary for initial or prototype designs.

The time to plan for powder metal parts production is in the early design stages.

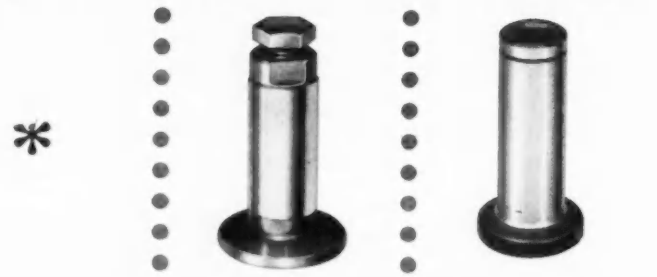
Once a prototype assembly is established, we are practically "Locked in" so far as detailed geometry is concerned. It's too late then to get the generous radii, wall thickness, chambers, etc., that we like to have to produce our part economically.

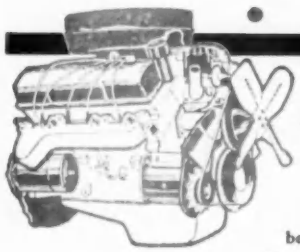
All too often we are required to meet mechanical specifications for some other material when actually those specifications are not necessary for the successful performance of an assembly.

The "benchmark" has been established. Time and money do not permit sufficient testing on our powder metal part.

Let's be sure we supply information and service at the time it is needed! ■

JOHNSON *tappets*





***for all engine applications**

All of the engineering and manufacturing effort at Johnson Products goes into producing a better tappet. Continual experimentation and exacting quality control make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of hardenable iron, steel, and chilled iron of various alloys, are used in JOHNSON TAPPETS. These tappets are successfully used in jobs ranging from light duty to the most severe, punishing applications. Serving all industry that employs internal combustion and diesel engines.

Johnson TAPPETS

"tappets are our business"

JOHNSON JP PRODUCTS

MUSKEGON, inc. MICHIGAN

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ANOTHER NEW
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AMBALLOY STEEL

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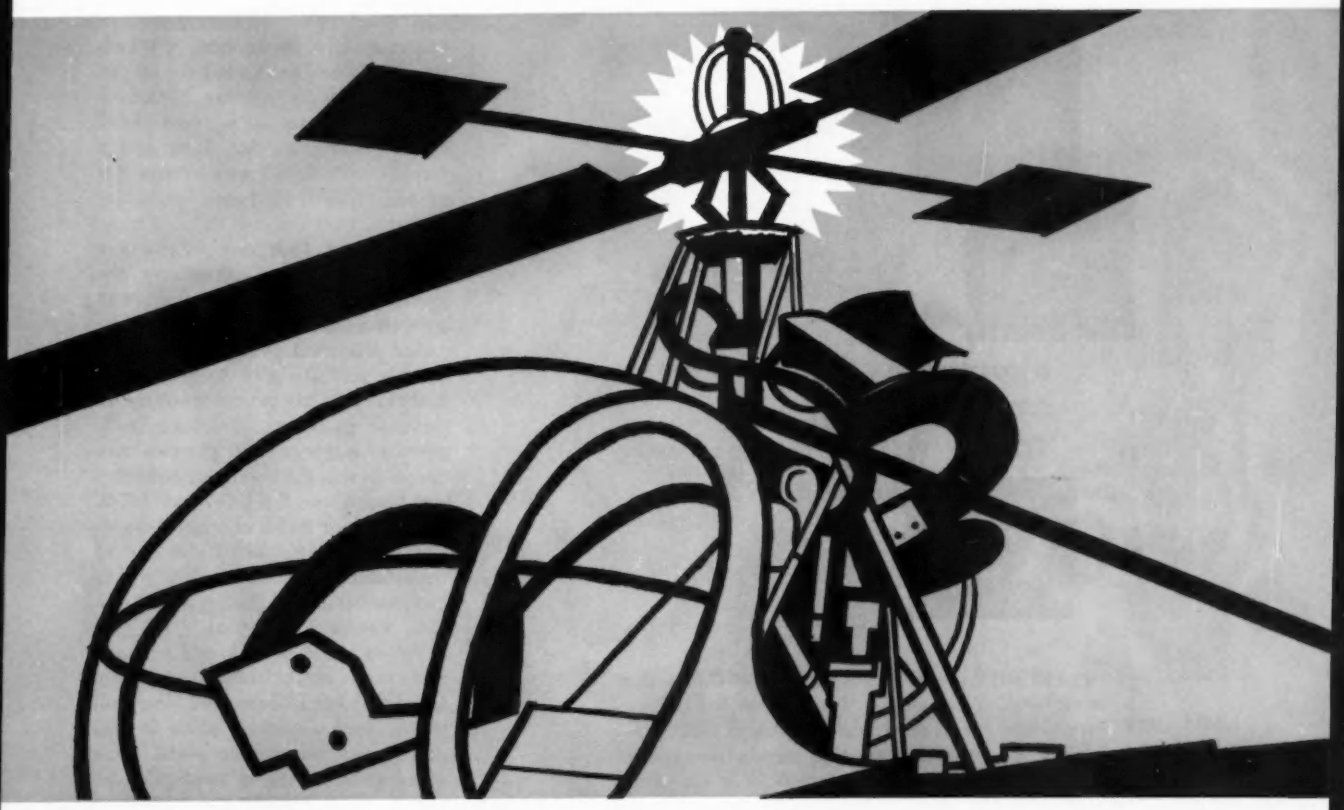

How technically competent is your source of aircraft quality steels? Byers Amballoy steel users are served by trained metallurgists. Amballoy is uniform in workmanship, quality and cleanliness. Amballoy cuts rejections, improves product performance, meets exacting requirements.

Evaluating materials for ultra-critical aircraft and missile applications? Consider Amballoy. Byers high-quality specialty steels boost performance of gear blanks, motor hubs, upset sections, tension rods, screw shafts, steering knuckles, piston assemblies, high stressed latch and catapult hooks, flanges, and gusset plates. Versatile Amballoy is increasing payload factors in scores of longitudinally and transversally loaded parts. For details, write: A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

Mighty mite. This straight bevel gear for power unit of Hiller Helicopter has a workhorse assignment demanding plenty of strength and stamina. Made of AISI-E 9310 Byers Amballoy Steel to Specification AMS 6260E at Vard, Inc., Pasadena.

aircraft quality steels from a technically competent source

A. M. BYERS COMPANY

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Here at BCA you'll find a number of things that work to your advantage. Production flexibility—even when everyone wants everything right now. Ability to fulfill unexpected needs for special engineering. A real appreciation of a supplier's obligation to meet "when-promised" delivery dates. Pride of workmanship stemming from 50 years' experience in the design and production of quality ball bearings. All these pay off for BCA customers. They will pay off for you when you come to BCA for your original equipment and replacement ball bearing needs. Bearings Company of America Division, Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.

BCA BALL BEARINGS
BEARINGS COMPANY OF AMERICA
DIVISION OF
Federal-Mogul-Bower Bearings, Inc.

Lead and Zinc Meetings

(Continued from page 73)

12 per cent. This has become a bigger factor in supply during the past two years than domestic production. In a falling market consumers tend to underbuy, so that attempts to correlate consumption figures to metal indices or other guides are inaccurate over a period of one or even two years. For 1958, he gave consumption as 821,000 tons, down 11 per cent from 1957; supply, 974,000 tons, down 21 per cent; and the surplus as 153,000 tons, down 49 per cent from 1957.

Automotive production, which since 1950 has accounted for 60 per cent of the die casting outlet, is currently running 32 per cent ahead of last year, said Mr. Ince, and a forecast of 960,000 tons of zinc for consumption in 1959 may not be unrealistic.

Lead and lead compounds are finding applications in rocketry, the meeting was told. Lead telluride as a semiconductor is used in the five-pound electrical generator; 25 tons of slab lead are used to control vibration in a laboratory working on inertial guidance systems; lead-powder impregnated plastics are used for soundproofing on commercial planes like the DC-7 and DC-8.

A superior finish on zinc die castings can be produced by either of two plating systems worked out at Battelle Memorial Institute under a Zinc Research Program. The first is called the duplex nickel process, and is commercially available. Bright nickel is deposited over dull nickel, and a chrome plate is laid down over the double plate. This gives good corrosion protection at points where the chrome plate may have local defects. In the second, called bright, crack-free chromium plate, the emphasis is upon deposition of a defect-free chrome plate rather than on better under-plate. This is achieved by careful control of plating bath temperature, chromic acid-sulphuric acid ratio, and chromic acid concentration, and upon the thickness of the deposit. Superior deposits were obtained from baths operated at 130 F, containing 45 oz of chromic acid concentration, and a high chromic-sulphuric acid ratio. ■

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Smart move...choose...

Ross

STEERING

Passenger cars, trucks, tractors, buses, combines, cranes, earth movers, boats, fire engines, fork lifts, sweepers, scrapers, shovels; you name it . . . *all* rely on Ross for easy, safe, economical steering. Smart move, choose Ross for *your* steering needs.

ROSS GEAR AND TOOL CO., INC. • LAFAYETTE, INDIANA
Gemmer Division • Detroit

Steering manufacturers for original equipment since 1906

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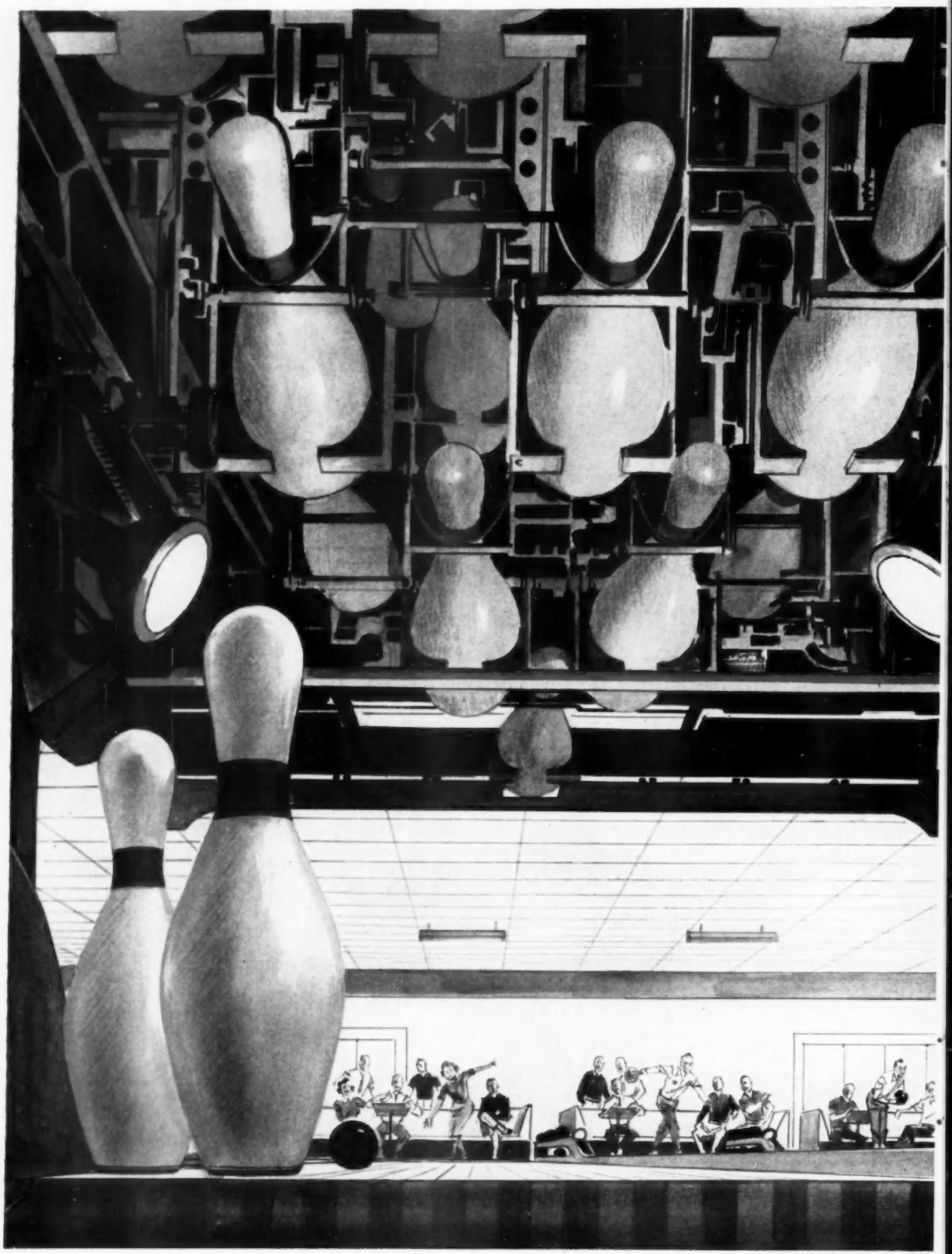
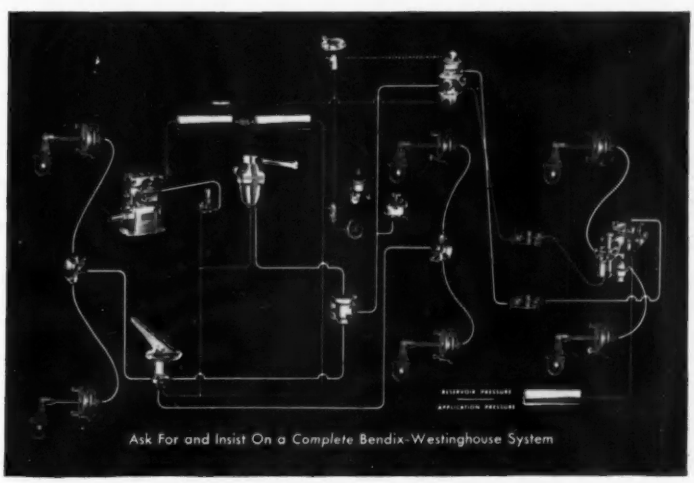


Dependable systems demand systems planning and engineering

A system does a superior job only if the preliminary planning and engineering have been done by people who are *systems thinkers.* This is as true of an air brake system as it is of the immensely complex workings of an automatic pin setting system—which practically thinks for itself.

For peak performance, both systems depend upon operating compatibility of a wide variety of precise and interrelated devices. Of course, it's always possible to buy components from a number of sources and trust that they can be assembled into an efficient braking system. But it's to your greater advantage to specify *a complete chain* of system-engineered components that will do the job with absolute reliability.

A Bendix-Westinghouse Air Brake System is such a chain. It gives you top performance for a longer period at lower over-all cost. Fleet operators know that we take full responsibility for the performance of every Bendix-Westinghouse Air Brake System. That's why more vehicles travel more miles with Bendix-Westinghouse Air Brakes than with all other air brakes combined.



Ask For and Insist On a *Complete* Bendix-Westinghouse System

SYSTEM — according to Webster: "Many parts connected in such a manner as to create a chain of mutual dependencies".

Bendix-Westinghouse

AUTOMOTIVE AIR BRAKE COMPANY

General offices and factory—Elyria, Ohio. Branches—Berkeley, Calif. and Oklahoma City, Okla.

ON OUR WASHINGTON WIRE

Neither political party is anxious to talk about higher taxes this year. National elections will be held in 1960. Control of both the White House and the Congress is at stake. Any hot issue that might annoy the voters is being soft-pedaled.

Whose taxes can be increased? The Committee for Economic Development warns that upper-income individuals and corporations are already taxed to the limit. The only places left to tax are middle and lower incomes, or a national sales tax.

Defense Dept. finally has released funds appropriated by Congress last year for three more nuclear-powered Polaris submarines. This will bring the total Polaris fleet to nine. The Navy also is authorized to contract for long-lead-time components for another three of the subs, which will be contracted about a year from now.

Because Government scientists often don't know what their colleagues in other places are doing, the Government has moved further into the publishing business and is now producing a new bimonthly periodical called "Science Information News."

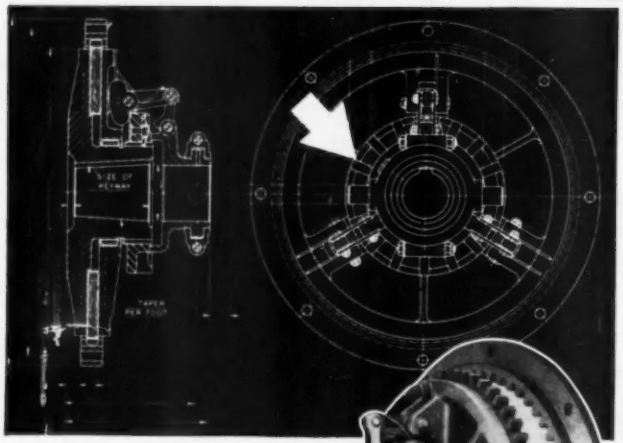
Although the Government denies any intent to compete with technical journals published by industry and by private enterprise, a glance at the first issue suggests considerable capacity for expansion into a full-fledged technical magazine. "The publication could well become the principal medium of new communication in the science information field," says a Senate subcommittee on science programs headed by Sen. Hubert Humphrey, D., Minn.

Aluminum-coated satellite is to give the U. S. new data on radio communication techniques. This 150-lb plastic sphere will be launched next fall to orbit at 1000 miles altitude. Once aloft it will inflate to 100-ft diameter and its aluminum coating will reflect radio signals from Earth back to ground stations.

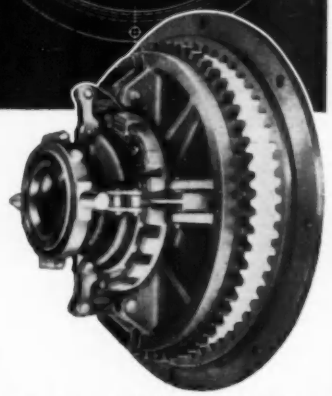
Scientists have started work on a huge seven-stage rocket which may take a man to the moon within the next four years. Dubbed "Nova," the rocket would use three stages on the outward journey; one to slow it down for a moon landing; and three to return to earth. Each of the first two stages would develop 1.5 million lb of thrust.

About half the scientific manpower in the Pentagon's Advanced Projects Research Agency is now working on various anti-missile defense schemes. These range from the nuclear Nike-Zeus to a possible "death ray" for energy missiles.

ROCKFORD



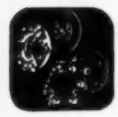
OVER-CENTER
Gear Tooth Drive
CLUTCHES
Provide for
➡ CLOSE
ADJUSTMENTS



A conveniently accessible adjustment ring provides for infinitely close adjustment—in ROCKFORD Over-Center CLUTCHES—without special tools. Fine adjustments can be made, and automatically maintained, without releasing or engaging separate locking devices which formerly limited adjustments to the spacing of notches or holes. This is but one of several exclusive features of ROCKFORD Over-Center CLUTCHES.

BW SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER
315 Catherine St., Rockford, Ill., U.S.A.
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.



Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

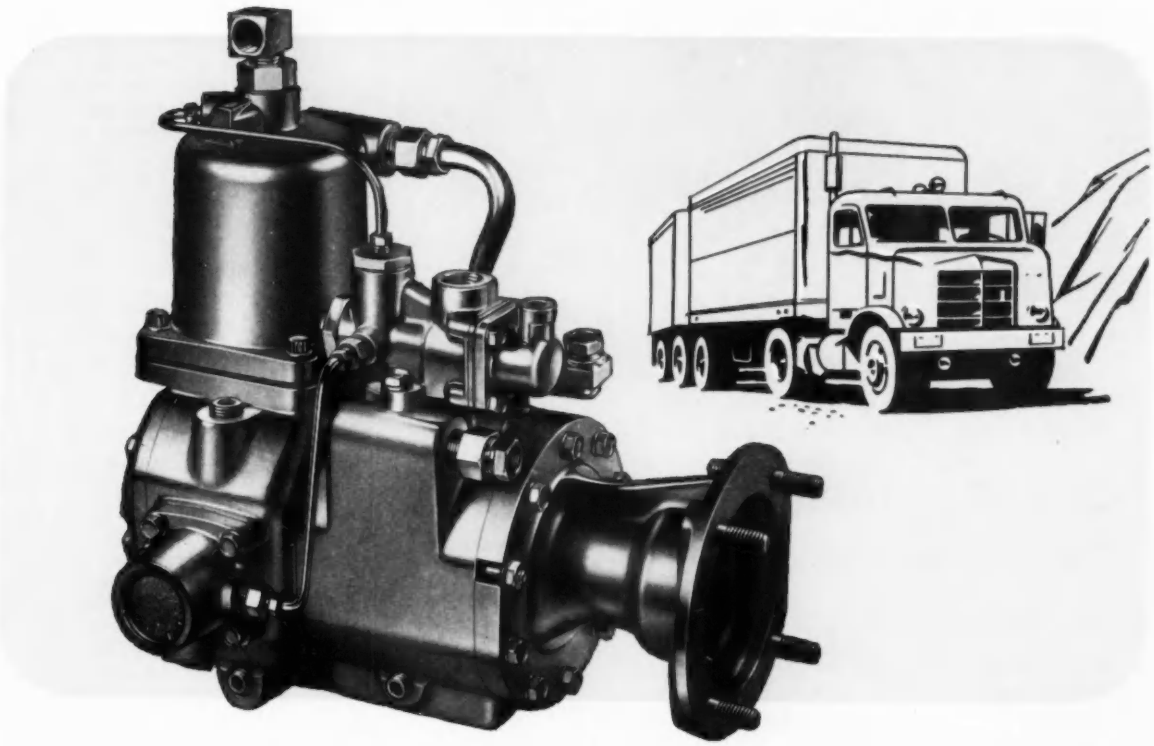
Heavy Duty Over Center

Power Take-Offs

Speed Reducers

CLUTCHES

More air reserve for safer braking of diesel powered trucks...



with WAGNER ROTARY DRIVE-THRU COMPRESSORS

The Wagner Drive-Thru Compressor features all the advantages of rotary compression . . . supplies more air reserve for braking diesel trucks . . . gives rapid air pressure recovery with smooth, quiet, cool operation.

The design of the compressor eliminates the use of thrust absorbing components and makes it possible to use rotary seals with a minimum of seal loading. Improved channeling permits better oil circulation to all moving parts—lengthens the service life of the pump and cuts maintenance.

NEW LUBRICATING VALVE. The lube valve on these units circulates cool engine oil through the compressor during the non-pumping cycle and cools the compressor between cycles by completely changing the oil in the sump. Compressor life is prolonged by constant, adequate lubrication.

For full information on these compressors, write to Air Brake Engineering Department, Wagner Electric Corporation, St. Louis 14, Missouri.

WK59-8

Wagner Electric Corporation

6363 PLYMOUTH AVENUE, ST. LOUIS 14, MISSOURI

LOCKHEED BRAKE PARTS, FLUID, BRAKE LINING and LINED BRAKE SHOES • AIR HORNS • AIR BRAKES • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES

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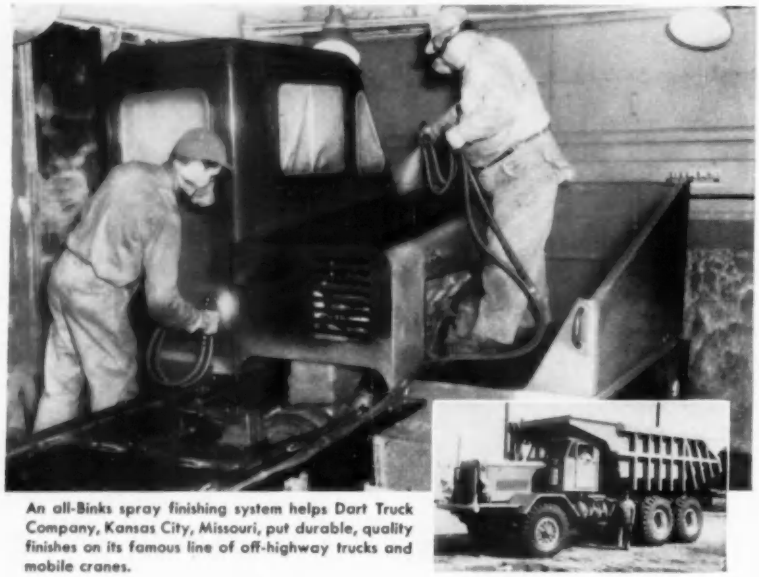


An all-Binks spray finishing system helps Dart Truck Company, Kansas City, Missouri, put durable, quality finishes on its famous line of off-highway trucks and mobile cranes.

Binks spray painting equipment...

Cuts Dart truck finishing time improves working conditions

"Our finishing production went up 25% and costs dropped by 10% after installing Binks spray painting equipment," reports Mr. Willard Cline, Dart Truck Company superintendent of production.

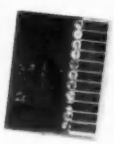
Working conditions improved.
In each of two painting areas, Binks water wash spray booths provide positive removal of overspray and fumes. Painters work steadily without having to take time out for a "breather."

All-weather air-intake system.
Air intake ducts to spray areas are filtered to keep out finish-damaging dust and dirt. In winter, intake air is heated to 75°F by steam pipes in the ducts.

Spray guns stay clean longer.
Binks Model 18 spray guns used in degreasing, priming and enameling operations resist clogging. Spray patterns stay perfect, enabling faster coverage with less work. Spray gun clean-up, when it is needed, is fast and easy.

Binks installation bonus.
The cooperative assistance provided Dart Truck by Binks field men—from installation design, equipment set-up and operation follow-through—turned economical standard equipment into a custom installation.

Send for Catalog 956.
See the broad range of manual and automatic Binks spraying equipment available for economically modernizing your finishing operation. Ask your Binks industrial distributor or Binks Branch Office for a copy, or write direct.



Ask about our spray painting school

Open to all... NO TUITION... covers all phases.

9321

Binks
EVERYTHING FOR
SPRAY PAINTING

SPRAY GUNS

MATERIAL HANDLING PUMPS

NATIONWIDE SERVICE

Binks Manufacturing Company
3120-30 Carroll Ave. West, Chicago, Ill.

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Circle 158 on Inquiry Card, for more data

NEW PRODUCTS

(*Continued from page* 89)

High Pressure Regulator

High pressure regulators of the 16000 series are integral plus proportional regulators which regulate outlet pressure to within 0.5 psi over the inlet pressure and flow range. They are normally closed, eliminating shock loading on the downstream system when the inlet system is suddenly activated.

The system uses internal pressure sensing, however, models are available with remote pressure sensing and also with a miniature, integral solenoid value providing a shut-off feature as well as regulation. They are for use in aircraft and missile applications. *Aerodyne Controls Corp.*

Circle 90 on postcard for more data

Speed Reducers

A line of high capacity, heavy duty worm gear speed reducers has been developed by *Philadelphia Gear Corp.*

The line is available from stock in all ratios from 5 1/6 : 1 to 1212 : 1 and in any horizontal or vertical drive arrangement. Center distances are from 3 to 21 in.

All units can be supplied with a torque control attachment to protect driving and driven equipment from damage due to overloads. When the output torque of the reducer exceeds a predetermined value, the torque control device mechanically actuates a microswitch to instantly break the motor control circuit.

Circle 91 on postcard for more data

Drilling Attachment

Multiple-hole drilling operations on cumbersome parts can be handled effectively with an attachment for adapting large multiple-spindle drilling and tapping heads to radial drilling machines. An air counterbalance and a 360 degree ball bearing swivel attachment has been combined for this purpose.

The air counterbalance, which is available in various strokes, handles the entire weight of the head and the tools. Two cylinders are employed to maintain a good, balanced condition of the head on the machine. Because the air is controlled on both ends of the stroke, only sufficient pressure is maintained to counterbalance the weight of the head during all portions of stroke. *United States Drill Head Co.*

Circle 92 on postcard for more data

FIRESTONE GIVES YOUR CARS NEW "COME ON" WITH *fashionized* ALUMINUM PARTS

Call on Firestone's fabricating and finishing abilities in mass-producing colorful, low-cost parts and trim for automotive products.

Call on the brightest brightwork in the business to turn comparison-shoppers into your new customers. Call on the eye-catching colors and qualities of aluminum formed and *Fashionized* by Firestone to supply new competitive appeal inside and out.

Call on *Fashionized*® Aluminum, and on Firestone's more than 50 years of metal-fabrication experience. Call, too, on the production capacities and competitive prices that only an automated anodizing line can supply —in part sizes up to seven feet long. Your inquiries and inspections are cordially invited.

FIRESTONE FASHIONIZED ALUMINUM
FIRESTONE STEEL PRODUCTS COMPANY, AKRON 1, OHIO

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23rd Machine Tool Forum

(*Continued from page 67*)

Magnetic Clamping

The increased use of electro-magnets in holding fixtures for machine tools was the subject of a presentation by F. L. Suchanek, sales engineer, Sundstrand Machine Tool Co. He described several milling applications which involved both large and small workpieces. Also an application on a lathe equipped with a rotary magnetic chuck for facing and boring clutch plates.

Saving in time and effort for the operator, reduced vibration in the workpiece during machining because of uniform distribution of the holding force, and improved accuracy from elimination of distortion in the workpiece while being machined were some of the advantages found in these applications.

Numerical Control

A numerically-controlled precision boring machine that utilizes straight electrical circuits and has no electronic equipment was described by C. R. Hibbard, sales manager, The Fosdick Machine Tool Co.

The machine is equipped with a mechanical measuring system which stacks Class A gages in establishing the coordinate dimensions. In the standard jig borer, the settings are made with direct-reading digital dials.

By the addition of an electromechanical positioning system, coupled to the measuring system and actuated by the operator depressing a pushbutton, the machine becomes more automatic in operation.

With the further addition of numerical control apparatus, the dials of the dimension measuring system are set automatically by electromechanical means directed by a tape reader and data storage system contained in a separate control console. This control console also has numerical preset dials for use where manual setting is desired in place of tape.

Electronic Sensing

Details of a means other than limit switch for terminating, at the end of the processing cycle, the cross-feed motion of a new high-speed grinding machine were presented by D. V. Dickey, chief electrical engineer, Bryant Chucking Grinder Co.

The control mechanism has an insulated stop which acts as the primary sensing element. A low d-c voltage is constantly applied to this stop, and when the cross-feed lever contacts the stop at the end of a grind, a short to ground occurs. Tied to the insulated stop is an electronic circuit which employs a gaseous Thyratron type 5696 tube. This tube is prevented from firing before the feed lever

(*Turn to page 113, please*)

MOLINE

FOR GREATER | PRODUCTION • EFFICIENCY • SAVINGS

Use rugged, reliable "Hole Hog" machine tools for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

Over 58 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

112

Twenty-Station, Ten-Unit Transfer Machine for boring, counterboring, chamfering and valve clearance operations on V-8 automotive engine blocks. (Shown above)

MOLINE TOOL CO. MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20TH STREET • MOLINE, ILLINOIS

REPRESENTATIVES IN PRINCIPAL CITIES

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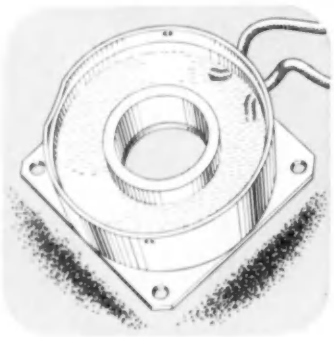
Crucible stainless matches your high standards

Coil after coil of Crucible stainless gleams with unsurpassed lustre because it is precision-rolled on modern mills. Furthermore, Crucible maintains uniform qualities by methodically checking each heat — and ensures precise gauge with electronic measuring controls. For stainless in all gauges down to .010" and in all strip widths, call or write: Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.

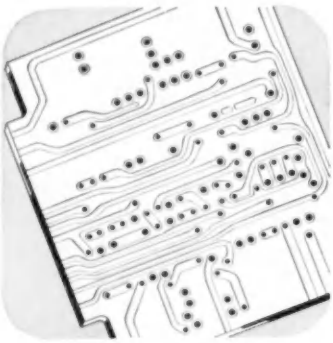
CRUCIBLE STEEL COMPANY OF AMERICA

CANADIAN DISTRIBUTOR — RAILWAY AND POWER ENGINEERING CORP., LTD.

How you can cut time and costs with R/M *Ray-BOND*® Adhesives

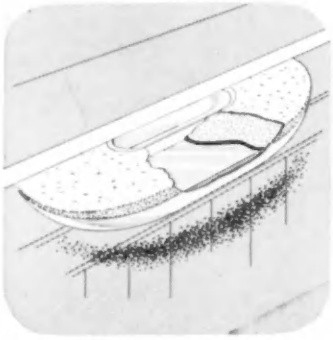


Casting compound for electrical applications



Bonding printed circuits

Bonding textile to textile



Bonding synthetic foam to metal in auto armrest

Bonding "Teflon"* to steel

*A Du Pont trademark

Sealer for automobile window channel

FOR THESE AND 1001 OTHER APPLICATIONS NEW R/M RAY-BOND ADHESIVES CAN BE TAILORED TO YOUR NEEDS

The number of new places you can use adhesives today is growing faster than ever. With new bonding techniques, with modern Ray-BOND adhesives, you can cut fastening time and costs in a variety of applications never possible before.

R/M Ray-BOND adhesives are of two different types—thermosetting and thermoplastic. They are available in different degrees of viscosity—for either spraying or painting. They give top performance under the most severe operating conditions—withstand temperature extremes ranging from -80° to +700°F.

Whether or not you've yet considered bonding, laminating, sealing or coating in your own operations, talk to an R/M engineer now. From over 20 years' pioneering in the production of bonded assemblies and the manufacture of adhesives and coatings, R/M has acquired a wealth of knowledge and experience that might help you find new ways to improve your product or cut costs. Write or call for complete information on new Ray-BOND adhesives now.

R/M Bulletin No. 700 contains engineering information you will want on Ray-BOND adhesives, protective coatings and sealers. Write for your free copy.

RAYBESTOS-MANHATTAN, INC.

ADHESIVES DEPARTMENT: Bridgeport, Conn.

Chicago 31 • Detroit 2 • Cleveland 16 • Los Angeles 58

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; Passaic, N.J.; No. Charleston, S.C.; Crawfordsville, Ind.; Neenah, Wis.; Paramount, Calif. Raybestos-Manhattan (Canada) Limited, Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Industrial Adhesives • Brake Linings • Brake Blocks • Clutch Facings • Industrial Rubber • Engineered Plastics • Sintered Metal Products Rubber Covered Equipment • Asbestos Textiles • Laundry Pads and Covers • Packings • Abrasive and Diamond Wheels • Bowling Balls

Machine Tool Forum

(*Continued from page* 110)

contacts the insulated stop, through a circuit which applies a negative voltage to the grid of the tube via the insulated stop. When the feed lever contacts the insulated stop, the negative grid bias is shorted to ground, and the grid becomes sufficiently positive to cause the tube to conduct and operate the control components.

Static A-C Switch

Characteristics of the silicon Trinistor, a new three-terminal semiconductor device that "lends itself well to static a-c switch circuitry," were outlined in a talk by E. A. Petrocelli, solid state electrical engineer, Westinghouse Electric Corp. This speaker also gave some results of tests with a prototype model of a static switch designed around the new device.

The switch with the Trinistors has been found applicable where a high alternating current must be controlled by a low value of control power. In the model form, it successfully switched sizes 3 and 2 contactors connected in parallel, handling 2-kva inrush power controlled with an input of less than one milliwatt.

This switch also has application as an output device for static logic systems. A potential use is the handling of high inductive loads directly, without contactors and interposing relays.

Silicon Trinistors with breakover voltages of 400 and current-handling capabilities of 50 amp, are also under development, the author stated, with expected commercial availability the latter part of this year. ■

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are:

AMERICAN AIR FILTER CO., DEFENSE PRODUCTS DIV., Rock Island, Ill.
Engine, gasoline, 1 cylinder—$60,211

AMERICAN MOTORS CORP., Detroit, Mich.
Automobile, sedan, 1,748 ea—$2,446,603

AUTOMATIC TRANSPORTATION CO., DIV. OF YALE & TOWNE MFG. CO., Chicago, Ill.
Truck, hand lift, electric, 24 ea—$26,085

AVCO MANUFACTURING CORP., LYCOMING DIV., Stratford, Conn.
Shaft-turbine aircraft engines, 126 ea—$2,700,000

B.G. CORP., Ridgefield, N. J.
Spark plug, aircraft reciprocating, 1,223,900 ea—$1,449,097

BEECH AIRCRAFT CORP., Wichita, Kans.
Spare parts, aircraft, 25 to 3,500 ea—$50,995

BELL HELICOPTER CORP., Fort Worth, Tex.
H-13H helicopters,—$500,000

BENDIX AVIATION CORP., BENDIX PRODUCTS DIV., South Bend, Ind.
Brake assy, aircraft, 798 ea—$99,351

BENDIX AVIATION CORP., BENDIX PRODUCTS DIV., South Bend, Ind.
Spare parts, aircraft—$598,537

BENDIX AVIATION CORP., BENDIX PRODUCTS DIV., South Bend, Ind.
Spare parts for strut assys, aircraft—$71,057

BENDIX AVIATION CORP., BENDIX PRODUCTS DIV., South Bend, Ind.
Strut assy, nose landing gear, 12 ea—$27,108

passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period April 1 to April 30, inclusive.

BENDIX AVIATION CORP., PACIFIC DIV., North Hollywood, Calif.
Spare parts, aircraft—$70,652

BERTEA PRODUCTS, Pasadena, Calif.
Spare parts, aircraft—$25,442

BROCKWAY MOTOR TRUCKS, DIV. OF MACK TRUCKS, INC., Cortland, N. Y.
Truck, tractor, 94 ea—$769,522

CHRYSLER MOTORS CORP., Washington, D. C.
Trucks and passenger cars, 481 ea—$659,384

CHRYSLER MOTORS CORP., Detroit, Mich.
Automobile, sedan, 548 ea—$836,981

CHRYSLER MOTORS CORP., Detroit, Mich.
Truck, ambulance, 17 ea—$63,873

CLARK EQUIPMENT CO., Battle Creek, Mich.
Truck, fork lift, 165 ea—$2,926,478

CLARK EQUIPMENT CO., Buchanan, Mich.
Trucks, forklift, 20 ea—$90,837

CLEVELAND PNEUMATIC TOOL CO., A DIV. OF CLEVELAND PNEUMATIC INDUSTRIES, INC., Cleveland, Ohio
Strut assy, nose landing gear, 83 ea—$19,331

COOPER TIRE & RUBBER CO., Findlay, Ohio
Tire, 5,700 ea—$198,417

CURTISS-WRIGHT CORP., SOUTH BEND DIV., South Bend, Ind.
Scraper, earth moving, 300 ea—$3,718,500

(*Turn to page* 116, *please*)

completeness

Completeness at Southern Screw starts with the placing of your order and continues through the shipment of your screws on free disposable pallets. Whether your screws are supplied from stock or manufactured to your specifications, customers know that Southern Screw's completeness includes the consistent and constant quality and service they have a right to expect. Your fastener requirements really may call for "specials" which are standard in Southern Screw's 1,500,000,000-piece stock.

Let Southern demonstrate what completeness means on your next fastener requirement.

Machine Screws & Nuts ● Wood Screws ● Tapping Screws ● Stove Bolts ● Drive Screws ● Hanger Bolts ● Carriage Bolts ● Dowel Screws

Manufacturing and Main Stock in Statesville, North Carolina

Warehouses:
New York ● Chicago ● Dallas ● Los Angeles

Southern SCREW COMPANY
STATESVILLE • NORTH CAROLINA

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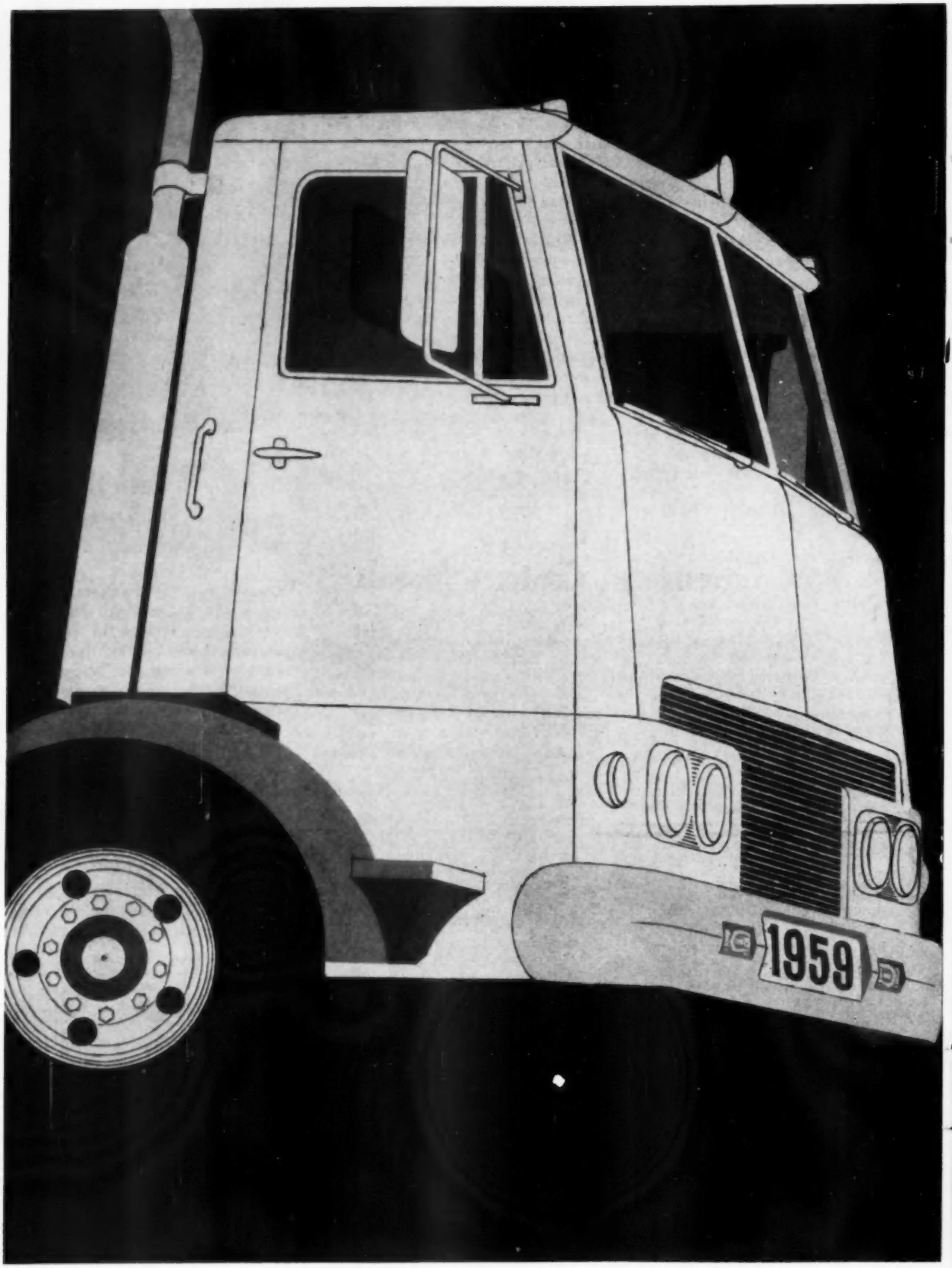
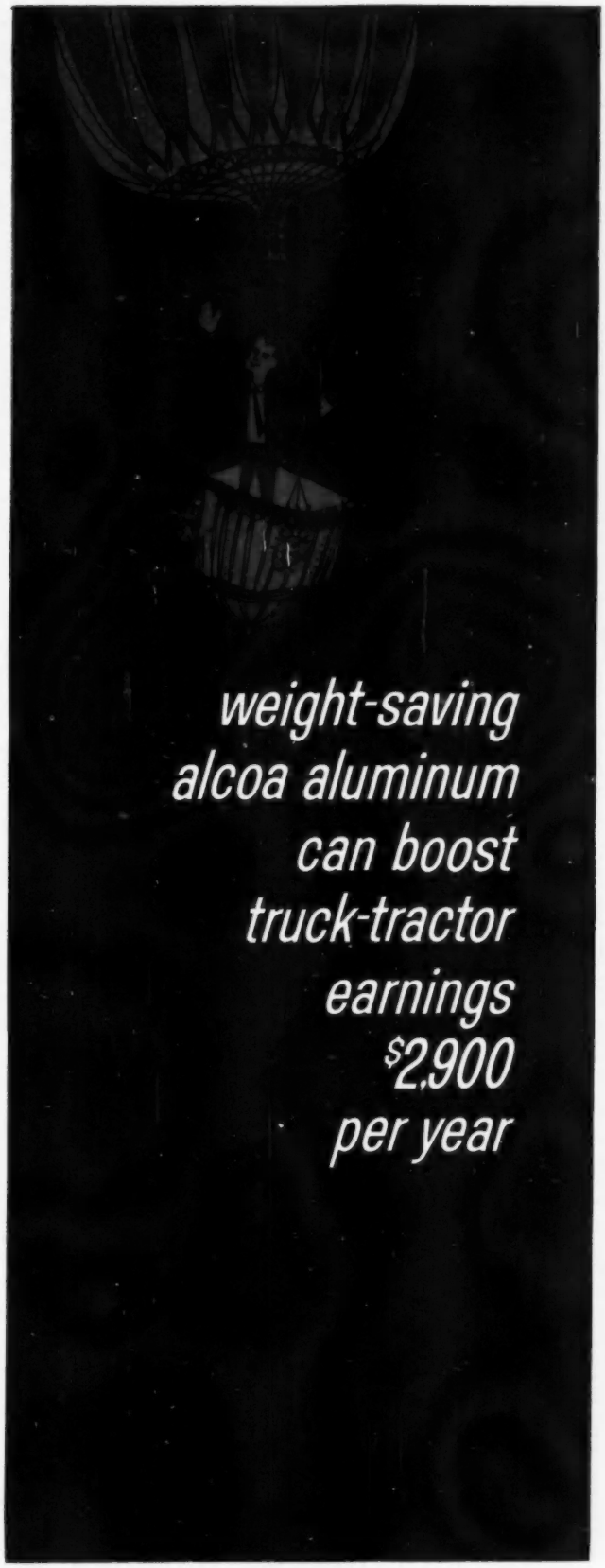

1959



The fleet operator today is willing to pay a premium for every pound of dead weight trimmed from his equipment. The reason—narrowing profit margins and confining legal weight limits. Every pound of dead weight shed makes way for an extra pound of payload worth $1 a year—or even more—in extra revenue for the operator.

2,896 Lb—Total Weight Savings With Aluminum. Alcoa, through research and close work with truck builders, has made it possible to give you the means to eliminate up to 2,896 lb of dead weight by designing with aluminum. The premium paid for an aluminum unit is returned to the operator in the first year of service; after that, it's all extra profit. Here is where these weight savings can be made:

2,025 Lb in Chassis Applications. Tandem rear axle components—axle housing, differential carrier castings, brake spiders and shoes and wheel hubs—save 570 lb in aluminum, compared to steel. Ten Alcoa® Aluminum Forged Disc Wheels each weigh 36 lb less than their steel counterparts, and savings of 280 lb on spring hangers and tandem axle suspension bring the total weight reduction to 1,210 lb.

Use of extruded and fabricated aluminum parts for structural members, fuel and air tanks and the front bumper can save an additional 815 lb. The extrusion process, by putting the metal exactly where it is needed for strength, provides the most efficient frame rails obtainable today.

541 Lb in Engine and Accessories. In an engine of approximately 500 cu in., aluminum cuts weight by 250 lb in the cylinder block and crankcase alone. Other reductions in the cylinder head, oil pan, timing gear cover, intake manifold and flywheel housing add up to 393 lb. Weight savings reach 541 lb through other reductions in the clutch housing, transmission case and cover, and auxiliary transmission case and cover.

330 Lb in Cab Components. There are 18 major components in cab design where aluminum cuts weight. Exterior and interior door panels and rear panels, roof, cowl, dash seat box, battery box and rear floor assembly all weigh 50 per cent less in aluminum. Weight saving for the radiator shell assembly is a whopping 47 lb. An aluminum hood assembly weighs only 31 lb, compared to 69 lb for its steel counterpart. Other important reductions occur in floor board, toe board, toolbox pan, radiator core, running-board assemblies and miscellaneous reinforcements. In all, they add up to a reduction of 330 lb.

Let Alcoa Help. Alcoa researchers have over a half century of experience and have developed over 90 per cent of all aluminum alloys. They have at their disposal the largest and most modern facilities in the industry. All this is available to help you design maximum profit through minimum weight into America's trucks. Let us work with you on the development of aluminum applications for high-performance automotive equipment. Write Aluminum Company of America, Development Division, 1786-E Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM GIVES EVERY CAR AND TRUCK MORE GLEAM AND GO

ALCOA ALUMINUM

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

Your Guide to the Best in Aluminum Value

(*Continued from page* 113)

CURTISS-WRIGHT CORP., WRIGHT AERONAUTICAL DIV., Wood-Ridge, N. J.
Engines, 24 ea—$1,871,256

DAYTON RUBBER CO., Dayton, Ohio
Tire, 8,400 ea—$328,944

DENMAN RUBBER MANUFACTURING CO., Warren, Ohio
Tire, 1,009 ea—$45,909

DOUGLAS AIRCRAFT CO., INC., CHARLOTTE ORDNANCE MISSILE PLANT, Charlotte, N. C.
NIKE spare parts & components—$31,161

DOUGLAS AIRCRAFT CO., INC., SANTA MONICA DIV., Santa Monica, Calif.
Spare parts, aircraft—$222,950

ELECTRIC AUTO-LITE CO., Toledo, Ohio
Battery, 38,400 ea—$651,648

ELECTRIC AUTO-LITE CO., Toledo, Ohio
Spark plugs, 1,600,000 ea—$672,000

ELECTRIC AUTO-LITE CO., Toledo, Ohio
Spark plug, unshielded, 113,650 ea—$30,290

ELECTRIC STORAGE BATTERY CO., EXIDE INDUSTRIAL DIV., Phila., Pa.
Battery, storage, 7,083 ea—$156,534

FAIRBANKS, MORSE & CO., Fair Lawn, N. J.
Repair parts for Diesel engines, various, 15,104 ea—$112,910

FIRESTONE TIRE & RUBBER CO., Los Angeles, Calif.
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Trucks and passenger cars, 31 ea—$58,211

FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.
Truck, 1 ea—$15,226

FRUEHAUF TRAILER CO., Los Angeles, Calif.
Flat bed transporter—$1,500,000

FRUEHAUF TRAILER CO., Seattle, Wash.
Dual axle trailers, 7 ea—$25,725

GARRETT CORP., AIRESEARCH MANUFACTURING DIV., Los Angeles, Calif.
Spare parts, aircraft—$1,089,722

GARWOOD INDUSTRIES, INC., Wayne, Mich.
Ground support equipment—$73,179

GENERAL DYNAMICS CORP., CONVAIR DIV., San Diego, Calif.
Spare parts, aircraft—$685,657

GENERAL ELECTRIC CO., Schenectady, N. Y.
Repair parts, turbines, various, 558 ea—$51,136

GENERAL ELECTRIC CO., AIRCRAFT GAS TURBINE DIV., Cincinnati, Ohio
Turbo-jet aircraft engines, 5 ea—$1,392,500

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Truck, cargo, 24 ea
Truck, van, 2 ea
Truck, chassis, 3 ea—$93,963

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Truck, cargo, pickup, 13 ea—$34,930

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Trucks, passenger cars, 613 ea—$798,465

GENERAL MOTORS CORP., TRUCK & COACH DIV., Pontiac, Mich.
Truck, dump, 311 ea
Truck, wrecker, 1 ea—$1,323,812

GENERAL TIRE & RUBBER CO., Akron, Ohio
Wheel assys., nose, aircraft, 2,143 ea—$119,100

GISHOLT MACHINE CO., Madison, Wis.
Turret lathe, universal saddle type, 3 ea—$258,945

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Spare parts, aircraft—$57,830

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Wheel assy., aircraft, 1,092 ea—$337,039

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Wheel assy., tail, 916 ea—$31,373

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Wheel assys., aircraft, 77 ea
Brake assys., aircraft, 149 ea—$67,797

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Wheel assys., main, various—$160,432

B. F. GOODRICH CO., AVIATION PRODUCTS DIV., Akron, Ohio
Wheels, landing gear, various—$27,927

B. F. GOODRICH CO., Dayton, Ohio
Spare parts—$94,799

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Brake assys., main landing gear, various, 540 ea—$85,266

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Spare parts, aircraft—$124,034

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Spare parts for wheel assy., aircraft—$72,229

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel assy., 654 ea
Brake assy., 204 ea—$347,256

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel assy., nose, 147 ea—$35,160

(*Turn to page* 119, *please*)

WHY ROCHESTER-GM CARBURETORS ARE

AMERICA'S NUMBER ONE ORIGINAL EQUIPMENT CARBURETORS!

NEW PERFORMANCE AND ECONOMY FEATURES ASSURE *CUSTOMER SATISFACTION!*

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Customers sit up and listen—when your sales story includes Rochester-GM Carburetors. For here are new features that deliver the performance and economy you promise.

For example, various models of this year's Rochester-GM Carburetors contain these new features: *built-in hot-idle compensator* to improve idling characteristics, *fuel filter system* to prevent flooding, *fuel bowl venting system* to prevent engine stalling, *vacuum assisted floats* to give better fuel control, *new fast-acting choke* to improve performance and economy during cold drive-away.

In addition, you back your performance and economy story with quality. Rochester-GM Carburetors are engineered exclusively for GM cars. So keep an eye on your customer's satisfaction . . . keep a Rochester-GM Carburetor on his car. *Rochester Products Division of General Motors, Rochester, New York.*

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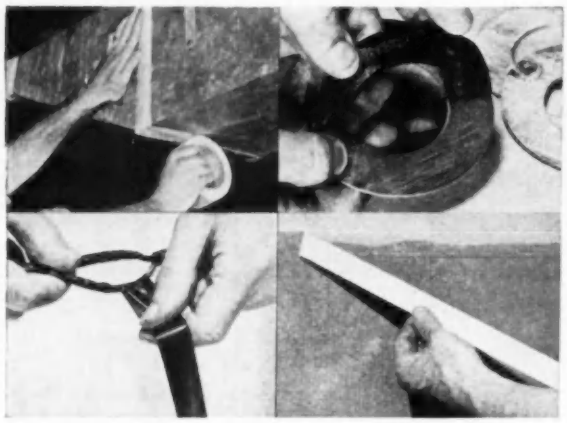
Paper-backed tapes for masking, protecting, packaging ...plastic-backed tapes for insulating, sealing and splicing . . . cloth-backed tapes that bind and waterproof . . . specialty tapes for heat-sealing, bonding, reinforcing.



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Los Angeles — Kent H. Landsberg Co. Inc.
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Los Angeles — Wilson Paper Co.
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San Francisco — Gilmore Steel & Supply Co.
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Bridgeport — Rourke-Eno Paper Co.
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FLORIDA
Jacksonville — Industrial Marine Service
Jacksonville — Sperry Packaging & Distributing
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Atlanta — Dillard Paper Co.
Atlanta — Wyant & Sons Paper Co. National Paper Div.
Macon — Dillard Paper Co.

ILLINOIS
Chicago — Abana Products Inc.
Chicago — Chicago Paper Co.
Chicago — Chukerman Paper Co.
Chicago — Durable Products
Chicago — Inlander-Steindler Paper Co.
Chicago — Knox & Schneider
Chicago — Schwarz Paper Co.
Peoria — Schwarz Paper Co.

INDIANA
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Boston — Andrews Paper Co.
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Springfield — Rourke-Eno Paper Co., Inc.
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Detroit — F. W. Winne & Son Inc.
Grand Rapids — Grand Rapids Paper Co.
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Muskegon — Steindler Paper Co.

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Joplin — Joplin Paper Co.
Kansas City — Bossert Company
Kansas City — Wertgame Paper Co.
Kirkwood — Industrial Ideas
St. Louis — Royal Papers, Inc.
St. Louis — Rubber Products Corp.

MONTANA
Billings — Winter Hardware Co.

NEBRASKA
Omaha — Nogg Bros. Paper Co.

NEW JERSEY
Clifton — Ralph E. Baker Co.
Elizabeth — Hand Hardware
Englewood — Coronet Paper Corp.
Hoboken — D. S. MacCorkle, Inc.
Newark — Abco Plastic & Supply Co.
Newark — Herbert A. Post, Inc.
Paterson — Theodore R. Levine & Sons
Ridgefield — George H. Swatek
Trenton — Pack & Seal, Inc.

NEW MEXICO
Albuquerque — Equipment Sales & Mfg. Co.

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Astoria, L. I. — Herbert A. Post, Inc.
Buffalo — Hartfield-Healy Supply Co
Buffalo — Presque Isle Paper Products
Buffalo — Union Paper & Twine Co.
Cohoes — Shoemaker Paper Co
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Elmira Heights — The Welles Supply Co
Jamaica — Pacific Supply Co
Long Island City — Viking-Criterion Paper Corp.
New York — Coy Disbrow, Div. of Pohlman Co., Inc
New York — Geo. W. Millar & Co., Inc
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Cleveland — Union Paper & Twine Co.
Columbus — The Cincinnati Cordage & Paper Co.
Dayton — Reliable Rubber Products Co.
Hubbard — Federal Wholesale Co.
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Youngstown — The Hearn Paper Co.

OKLAHOMA
Oklahoma City — C. B. Anderson Co.
Oklahoma City — Service Supply, Inc.
Tulsa — C. B. Anderson Electric Co.
Tulsa — Industrial Equipment Co.
Tulsa — Tulsa Paper Co.

OREGON
Portland — Western Fibrous Glass Products
Portland — General Rubber & Supply Co.

PENNSYLVANIA
Hershey — Hershey Paper Co.
Johnstown — Morris Paper Co.
Lancaster — United Twine & Paper Co.
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Houston — Frank W. Winne & Son, Inc.

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Salt Lake City — Great Western Supply Co.
Salt Lake City — J. B. Tile Co.

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Norfolk — Empire Machinery & Supply Co.
Norfolk — J. Henry Holland Corp.
Richmond — Industrial Supply Corp.
Roanoke — Dillard Paper Co.

WASHINGTON
Seattle — Marinco Supply Inc.
Seattle — Western Fibrous Glass Products
Spokane — Zellerbach Paper Co.

WISCONSIN
Appleton — Universal Paper Co.
Madison — Schwarz Paper Co.
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Milwaukee — Reliable Paper Co., Inc.
Neenah — Sawyer Paper Co.

HAWAII
Honolulu — Chapson Bros. Ltd.
Honolulu — The Thom Co., Inc.

Polyken
INDUSTRIAL TAPES

(*Continued from page* 116)

HOUDAILLE INDUSTRIES, INC., BUFFALO HYDRAULIC DIV., Buffalo, N. Y.
Spare parts, aircraft—$69,162

HYDRA-POWER CORP., New Rochelle, N. Y.
Spare parts, aircraft—$114,119

HYDRO-AIRE, INC., Burbank, Calif.
Spare parts, aircraft—$132,482

INTERNATIONAL HARVESTER CO., Washington, D. C.
Truck, ambulance, 25 ea—$105,691

INTERNATIONAL HARVESTER CO., Washington, D. C.
Truck, chassis, 5 ea—$34,475

JACK & HEINTZ, INC., Cleveland, Ohio
Generators, engine driven, 100 ea—$45,850

JONES & LAMSON MACHINE CO., Springfield, Vt.
Turret lathe, universal heavy duty, 4 ea—$152,795

LEMUEL R. LANCE, INC., Philadelphia, Pa.
Boring, milling and drilling machine, 1 ea—$54,260

LEE RUBBER & TIRE CORP., Conshohocken, Pa.
Tire, 4,200 ea—$167,202

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Aircraft—$9,000,000

MARMON - HERRINGTON CO., Indianapolis, Ind.
Spare parts, trucks—$56,930

MENASCO MFG. CO., Burbank, Calif.
Spare parts, aircraft—$114,108

MOHAWK RUBBER CO., Akron, Ohio
Tire, 8,300 ea—$359,141

MOORE SPECIAL TOOL CO., INC., Bridgeport, Conn.
Grinders, jig, vertical spindle—$29,504

NORTH AMERICAN AVIATION CORP., Canoga Park, Calif.
Rocket engines—$2,645,000

NORTHWESTERN MOTOR CO., Eau Claire, Wis.
Tractor, wheeled, 23 ea—$75,881

PACIFIC TIRE & RUBBER CO., Oakland, Calif.
Tire, 18,702 ea—$534,633

PITMAN MFG. CO., Grandview, Mo.
Engine, gasoline, 4 cylinder, 38 ea—$38,639

W. E. SHIPLEY MACHINERY CO., Philadelphia, Pa.
Engine lathe, 7 ea—$64,777

STANDARD PARTS CO., Memphis, Tenn.
Transmission, mechanical, synchromesh type, 72 ea—$50,457

TOWMOTOR CORP., Cleveland, Ohio
Truck, forklift, 591 ea—$1,986,752

TRANSPORT TRAILER EQUIPMENT, Seattle, Wash.
Single axle trailers, 25 ea—$62,875

WALTER MOTOR TRUCK CO., Brooklyn, N. Y.
Truck, tractor, 6 ea—$88,068

WESTERN ELECTRIC CO., INC., New York, N. Y.
NIKE spare parts & components—$2,985,931

WESTERN HYDRAULICS & SERVICE CO., INC., Gardena, Calif.
Spare parts, aircraft—$58,861

WHITE MOTOR CO., REO DIV., Lansing, Mich.
Automotive spare parts—$26,690

WILLYS MOTORS INC., Toledo, Ohio
Trucks, 11 ea—$31,978
Spare parts, 23 ea—$53,763

WISCONSIN MOTOR CO., Milwaukee, Wis.
Engine, gasoline, 4 cylinders, 61 ea—$25,677

WORDEN SPECIALTY & MACHINE CO., Plymouth, Mich.
Automotive spare parts, replenishment—$163,170

YALE & TOWNE MFG. CO., YALE MATERIALS HANDLING DIV., Phila., Pa.
Truck, fork lift, 65 ea—$476,240

AIR BRIEFS

By David A. Partridge

Push-Button Exchange of Air Traffic Control Messages

A communications system that will enable an airline pilot and a ground control station to exchange flight information by merely pressing buttons is under development by the Radio Corp. of America.

The system is designed to permit automatic two-way radio communications between ground control and up to 500 aircraft every two minutes.

Known as the Automatic/Air/Ground Communications system (or AGACS, pronounced "Ajax") it is part of a long-range FAA experimental program which also includes surveillance of aircraft on the ground, including their landing, taxiing and preparing for take-off. RCA is scheduled to deliver models of the equipment in August.

The system consists of a piano-sized control console, manned by a ground control operator, and a mural display with dotted lines of lights, representing the message signals, flashing between simulated planes and ground installation. In actual operation only a quarter of a second is required for routine two-way exchange of information with each aircraft.

The system is designed to relieve both pilots and ground control operators of the necessity of oral conversation about routine flight information.

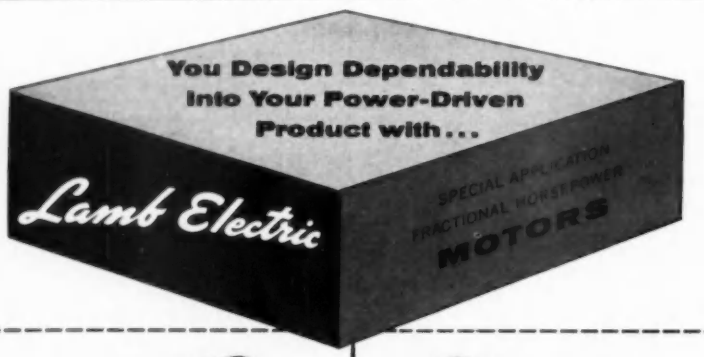
This will be done instead by electronic instruments. Some information—such as altitude and aircraft identity will be transmitted automatically without any action by the pilot. Other information—any one of 32 pre-conceived messages—can be transmitted by either the pilot or ground operator flicking a dial to the desired message number and pushing a button. Lights on both ends confirm receipt of the messages.

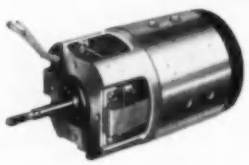
In emergencies, however, either pilot or ground controller can override the automatic system merely by pushing a button and communicating by voice.

Piston-Engine Airliner Disposal Problems

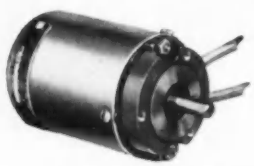
Disposal of surplus piston-engine airliners will become a critical problem within the next six months

(*Turn to page* 124, *please*)

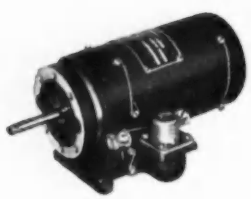




24 Volt DC motor for operation submerged in jet fuel for booster pump drive. Frame 4 x 1½



Six-pole 400 cycle AC motor for electronic cooling in missile control equipment. Frame 1⅛ x 1¼



Totally enclosed fan-cooled 27 volt DC motor for pump drive. Frame 2 x 1½

24 Volt DC fuel valve actuator incorporates gear train torque-limiting clutch and limit switches. Frame 1⅝ x ⅝

Thorough study by our engineering department of your product and its operating conditions is the first step in designing a Lamb Electric motor that will assure required dependability.

The next step is translating this information into a motor design having the electrical and mechanical characteristics needed for your particular application.

We then custom manufacture the motor on a volume basis to obtain high quality, uniformity and the most favorable cost.

May we discuss these advantages of Lamb Electric motors with you?

THE LAMB ELECTRIC COMPANY · Kent, Ohio
A Divison of American Machine and Metals, Inc.
In Canada: Lamb Electric — Division of Sangamo Co. Ltd. — Leaside, Ontario

Circle 168 on Inquiry Card, for more data

THERE'S A VERSATILE SAGINAW SCREW TO SOLVE EVERY ACTUATION PROBLEM

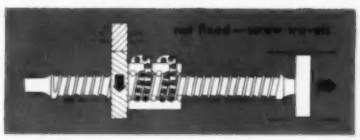
ACTUATES and POSITIONS WITH OVER 90% EFFICIENCY

- **POSITIONS MORE PRECISELY** than acme screws, hydraulics or pneumatics. Can be held within .0005 in./ft. of travel.
- **SAVES POWER** with over 90% efficiency. Permits much smaller motors, far less power drain, simplifies circuitry.
- **SAVES SPACE/WEIGHT** because Saginaw b/b Screws are compact. Allows smaller, lighter motors, gear boxes. Eliminates cumbersome auxiliary equipment.
- **DEPENDABLE PERFORMANCE.** Saginaw Screws are far more reliable than hydraulics. Gothic-arch grooves, yoke deflectors, multiple circuits increase assurance.
- **TEMPERATURE TOLERANCE.** Normal operating range is from —75°F. to +275°F. With selected materials, up to +900°F.
- **LUBRICATION LATITUDE.** If lube fails, the Saginaw b/b Screw still functions with remarkable efficiency.

The men who want to exact the maximum potential from their products specify the remarkable Saginaw Screw! The unequalled efficiency and precision of the Saginaw b/b Screw goes a long way to eliminate design and production problems. It actuates your product (large or small) more smoothly, simply, surely, and very often more cheaply than other methods. For full details, write or phone today for your free 1959 engineering data book on Saginaw b/b Screws and Splines.

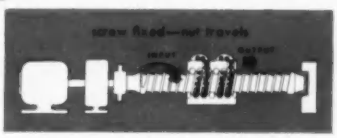
A FEW TYPICAL USES OF SAGINAW SCREWS:

- Airplane & Missile Components
- Photography Equipment
- Bumper Jacks and Lift Trucks
- Convertible Top Lifts
- Automatic Garage Doors
- Circuit Breakers
- Die Table Positioners
- Farm Equipment and many, many other applications



SCREW TRAVELS: When rotary motion is applied to the b/b nut, the screw glides along its longitudinal axis on rolling steel balls, converting rotary force and motion to linear force and motion with unprecedented efficiency.

NUT TRAVELS: When rotary motion is applied to the screw, the b/b nut glides along the axis of the screw on rolling steel balls, converting rotary force and motion to linear force and motion with *4/5 less* torque than acme screws.



WORLD'S MOST EFFICIENT ACTUATION DEVICE

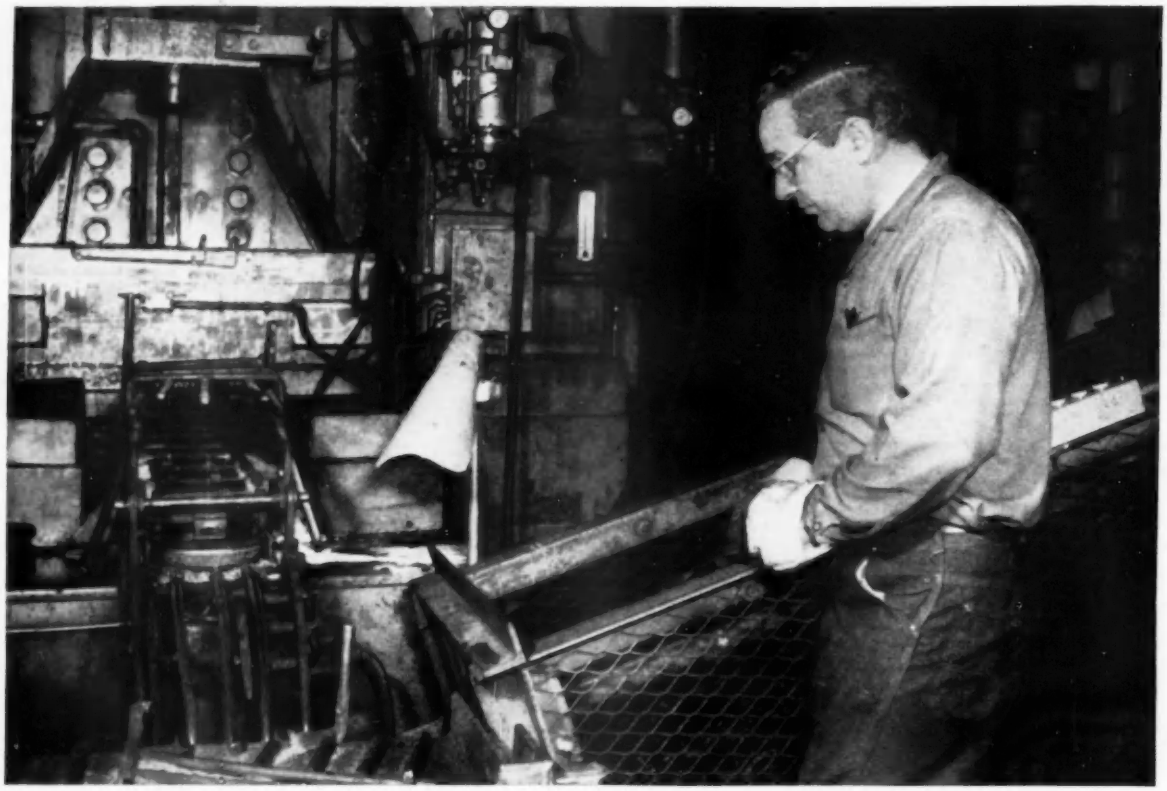
Saginaw ball bearing Screw

SAGINAW STEERING GEAR DIVISION OF GENERAL MOTORS • SAGINAW, MICHIGAN

WORLD'S LARGEST PRODUCER OF BALL BEARING SCREWS AND SPLINES

Circle 169 on Inquiry Card, for more data

Problem-Solving Products from Republic:



Alloy steel billets, four inches square, are fed into a seven-step forging press and emerge at the end as differential ring gear blanks.

REPUBLIC ALLOY STEELS PROVIDE STRENGTH AND TOUGHNESS FOR STRESS-RESISTANT RING GEARS

Fast starts and steep hills require tough, strong, dependable ring gears.

The Ford Motor Company, to maintain its reputation for quality, specifies only the finest steels. Ford uses Republic SAE 4028H series hot rolled Alloy Steel in forging the highest quality ring gears.

Republic Alloy Steel forging billets 4-inches square, are sheared into 5-inch lengths, heated, and put into an automated forging press. The billet goes through seven forging steps, passing from one die to another automatically. After forging the blank is annealed.

Alloy steels are unusually tough and strong. They can absorb sudden shock and impact without failure. Respond uniformly to heat treatment producing hard, wear-resistant surfaces around tough cores. This tough integral structure provides greater strength with greater dependability.

Field metallurgists working closely with Ford metallurgists and engineers in their own plants provided a metal that is tough and strong enough to withstand shock, impact, stress, and fatigue.

Republic's famed 3-Dimension Metallurgical Service Teams—field, mill, and laboratory metallurgists—are available to help you in selection, application, and processing of the right alloy steel for the job. It's confidential. There's no obligation. Send coupon for more information.

REPUBLIC NYLOK® STUDS solve fastening problem for Gravely Tractors, Inc., Dunbar, West Virginia. Problem: Find a dependable fastening method for tractor-attached rotary cultivators. Fastener must withstand constant shocks and pounding of rotary culvitating. Solution: Use Republic Nylok Studs. A special nylon insert assures positive locking at any position, even under severe shock, vibration, tension. Prevents all play. Utilizes metal-to-metal contact of opposing threads for locking. Republic Nylok Fasteners—studs, nuts, cap screws—resist heat, cold, moisture. Can be re-used. Interested? Mail coupon for full facts.

HARD DRAWN ROUND STEEL SPRING WIRE is providing outstanding performance in automotive seat and back cushions, and in furniture and bedding applications. Performance is assured by Republic quality. Standard High Carbon Spring Wire and MB High Carbon Spring Wire are produced by specialists who know and understand both steelmaking and high carbon wire practices. They know spring forming machines and the importance of physicals, finish, cast, and size accuracy in the finished product. Wire metallurgists will assist you in selection, application, and processing. Send coupon for details.

NEW HIGH STRENGTH POWDER, TYPE HS6460, opens the way for new applications using sinterings for highly stressed parts. Type HS6460 can be used with existing operating equipment. It provides a minimum tensile strength of 60,000 psi at 6.4 density as sintered, 100,000 psi heat treated. Type HS6460 maintains its dimensional characteristics after sintering—less than .004 inches per inch shrinkage from die size at 6.4 density. Available in production quantities up to and including 12 tons, or in multiples thereof. Mail coupon for technical data sheet.

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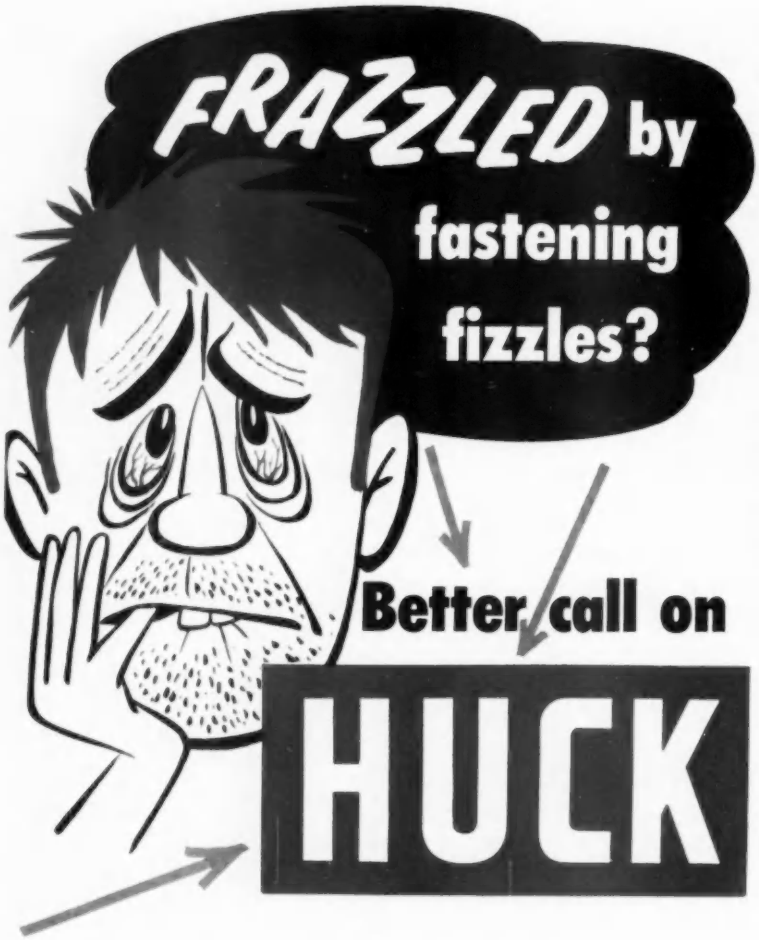
☐ Alloy Steels ☐ HS6460 Powder
☐ High Carbon Wire ☐ Nylok Fasteners
Have a metallurgist call:
☐ Alloy ☐ Metal Powder ☐ Wire

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

Circle 170 on Inquiry Card, for more data



HUCK means more than just good fasteners. It's a complete, well-tested system that affords efficiency, flexibility, and economy to many of the country's leading manufacturers.

The reason for Huck's superiority is simple. An intensive continuing development program that produces the "last word" in fasteners for your every requirement, in standard or exotic metals.

An aggressive tool development program that has produced simple, sturdy, lighter weight installation tools that will produce uniformly "skilled" quality fastenings in the hands of "unskilled" operators, with less fatigue.

A thoroughly experienced staff of fastening engineers who will carefully analyze your problem and give you accurate advice for its solution.

HUCK MANUFACTURING COMPANY

2480 BELLEVUE AVENUE • DETROIT 7, MICHIGAN • Phone WAlnut 3-4500

AIR BRIEFS

(*Continued from page* 120)

unless immediate constructive action is taken through Government-industry cooperation, stated Mr. Irving H. Taylor, Director, Export Service, Aircraft Industries Association.

"A recent Government survey shows that the U. S. air carriers, foreign air carriers and the U. S. military services plan to dispose of an estimated 1693 transport aircraft by the end of 1961. U. S. air carriers account for approximately half this number with 843 transports, all scheduled to be released during the next three years. The magnitude of this problem is emphasized by the $827 million original cost of these airframes and components plus improvements through 1957."

Aircraft Earnings Down; Sales Up

Earnings of the 12 major aircraft and missile manufacturers decreased during 1958 while sales increased compared with the previous year.

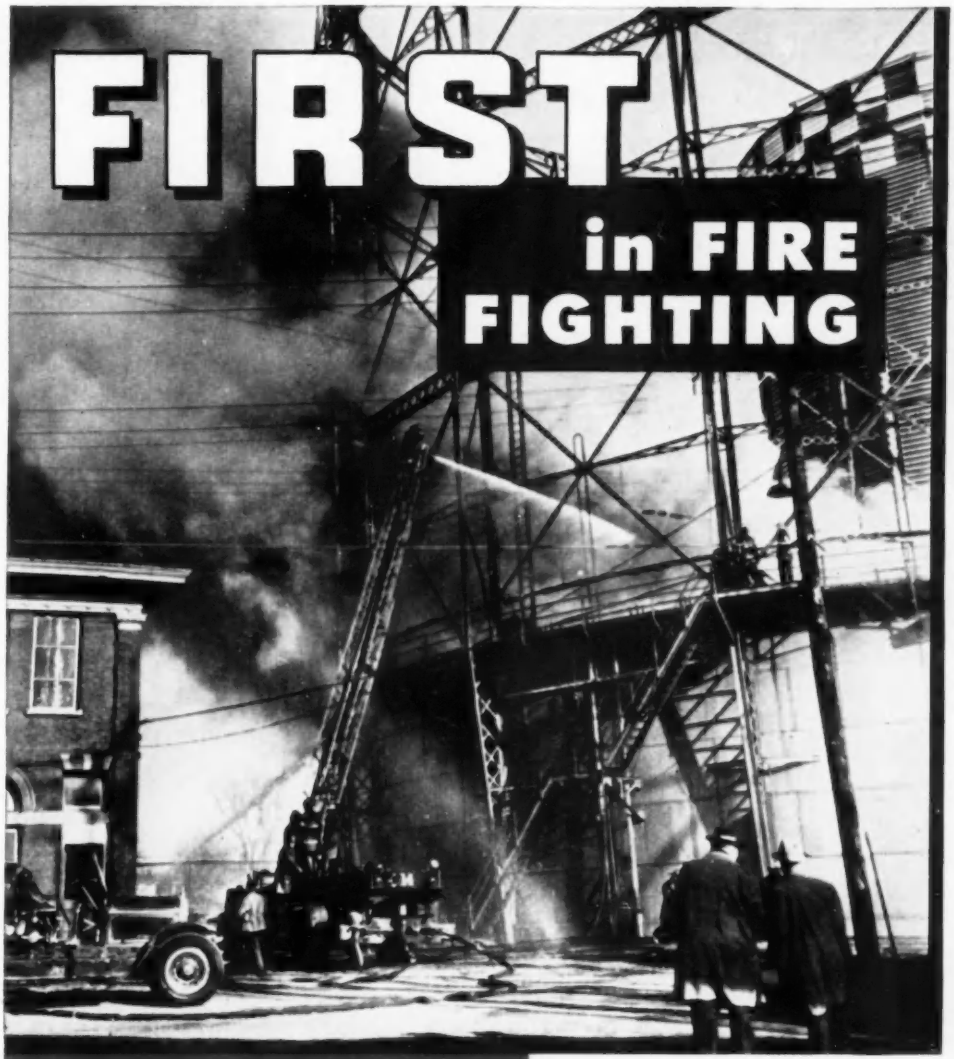
Dollar volume of sales by the 12 firms amounted to $7281 million, highest in the history of the industry, an increase of five per cent over last year's previous high of $6913 million. The commercial sales in 1958 accounted for 18 per cent of total sales, an increase of five per cent over the commercial-military sales ratio in 1957.

Earnings for the 12 companies continued their downward trend. Total earnings, after payment of $153 million in income taxes, amounted to $142 million, a rate of two cents per sales dollar. This compares with an average earning rate of about six cents per sales dollar for all other industries. Earnings in 1957 amounted to 2.4 per cent of sales and 2.8 per cent of sales in 1956.

Aircraft Employment Nation's Largest

The aircraft and parts industry during 1958 was the nation's largest manufacturing employer with an average of 757,500 workers. Next largest employer was the motor vehicle and equipment industry

FIRST in FIRE FIGHTING



PIRSCH

WARD LA FRANCE

CENTRAL

FWD

Fire Master Corp.

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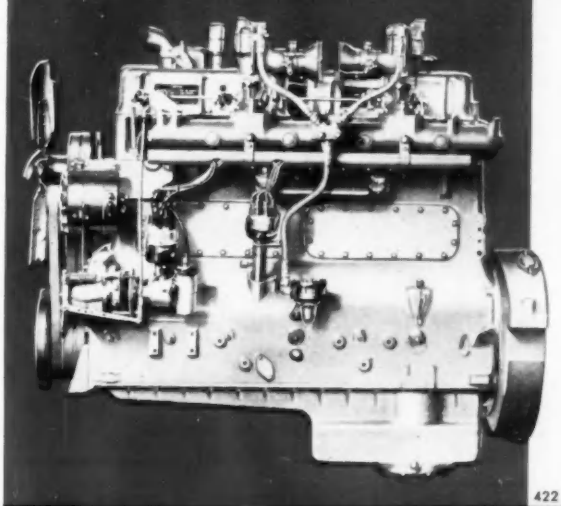
Thibault

UNIVERSAL

GENERAL

MAXIM MOTOR COMPANY MIDDLEBORO MASS. MAXIM

HF HOWE



Model 145-GZB—300 hp range High-Output Fire Fighter—

Six cylinders, 5⅜-in. bore x 6-in. stroke, 817 cu. in. displ., with counterbalanced and vibration dampened 3½-in. 7-bearing crankshaft; dual downdraft carburetion; dual ignition; precision extra high capacity bearings; removable wet type cylinder sleeves, aluminum pistons, overhead valves with Stellite-faced exhaust valves and seats. Arranged for full electrical equipment and all modern accessories. Get Bulletin 1662.

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN
New York • Tulsa • Los Angeles
Factories at Waukesha, Wis., and Clinton, Iowa

422

WAUKESHA *FIRE FIGHTER* ENGINES

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MACHINES ON THE MOVE...

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FAIRFIELD GEARS

GEARS to match the speed, size, and power of modern machines are a Fairfield specialty. This is possible because Fairfield is a leader in utilizing the most advanced methods, machines, and techniques for producing better gears. By specializing exclusively in "Fine Gears Made to Order", Fairfield has become one of America's largest independent producers of these parts.

If you use gears in the product you make, we believe it will pay you, as it has others, to become acquainted with FAIRFIELD—the place where fine gears are produced to meet your specifications EFFICIENTLY, ECONOMICALLY! Fairfield's production facilities are unexcelled. *Call or Write.*

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A "PLUS VALUE" IN ANY PRODUCT

Gears and Differentials for FINE GEARS *Made to Order for:*

TRACTORS • HEAVY DUTY TRUCKS • AGRICULTURAL MACHINERY • POWER SHOVELS AND CRANES
MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

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with an average of 627,300 workers.

However, the Bureau of Labor Statistics' report for February 1959 reveals that employment in the motor vehicle and equipment industry had increased to 724,100 workers while the aircraft and parts industry had decreased slightly to 756,600 workers from the 1958 average.

Aircraft Industry Wages Increase

The average weekly wage in the aircraft and parts industry during 1958 amounted to $101.91 compared with an average of $96.76 in 1957.

Average hourly earnings increased 15 cents an hour in 1958 over the previous year. The hourly earning in 1958 was $2.51 compared with $2.36 in 1957.

Average hours worked each week during 1958 dropped slightly to 40.6 hours compared with the 1957 average of 41.0 hours. ■

Triumph Herald

(*Continued from page* 69)

telescopic steering column, adjustable for length, that collapses under body weight to minimize driver injury in a crash; and front seats adjustable for height, rake and lateral position, and spring-loaded to remain tilted forward to ease entry of rear passengers.

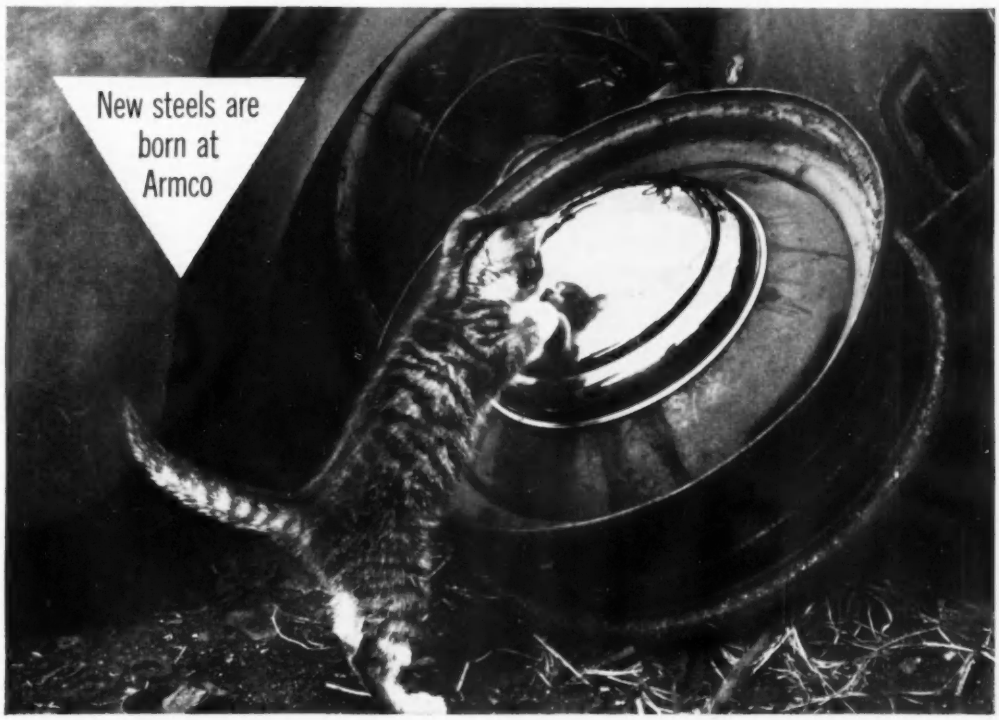
Basic power plant is a 57.8 cu in. engine developing 38.5 hp at 4500 rpm, and driving through a four-speed gearbox with stubby shift lever. Engine power on the coupe is boosted to 50.5 hp at 6000 rpm by twin S.U. carburetors and an 8.5 to 1 compression ratio.

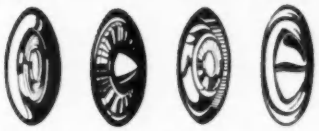
While the Herald is already in full production at Coventry, Standard is building a $5.6 million assembly plant at the Canley factory which will be completed in early 1960. This will be devoted largely to the new model and operated on the three-deck principle, having three parallel lines on the main floor with components supplied from basement stores and bodies conveyed on overhead tracks. ■

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

they help you sell...

Wheel covers that stay new are made of stainless steel





Nine lives? No—but this bright, rust-free hub cap in a field of worn-out autos is shining proof that stainless steel can be depended on to stay new-looking for the life of a car.

For wheel covers and hub caps, no other material can match all these quality advantages of stainless steel:

ENDURING GOOD LOOKS—The pleasing luster of Armco Stainless Steel is *built in*. It lasts and lasts under normal care, without extra precautions, special cleaners, or surface protection of any kind.

EXTRA TOUGHNESS—Solid, dense-grained Armco Stainless resists denting, gouging and scratching from rocks, gravel, curbs, and winter ice—retains its shape under impacts that easily damage softer metals.

LASTING STRENGTH—Because Armco Stainless Steel is exceptionally strong, wheel covers and hub caps need no reinforcement. They stay rigid, too—don't lose their "spring" no matter how often they're taken off and put on.

CORROSION RESISTANCE—Armco Stainless is made to resist rust. That's why it easily withstands effects of rain, snow, and street chemicals. Then too, it is not affected by even the strongest detergents or white wall cleaners used at home or in wash stations.

Service proved

Lifetime service by millions of stainless steel wheel covers and hub caps is the ultimate proof of their superior durability. That's why Armco Stainless Steel in these vital components can help clinch sales. Armco Steel Corporation, 1509 Curtis Street, Middletown, Ohio.

ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation Southwest Steel Products

Circle 174 on Inquiry Card, for more data

News of the

MACHINERY INDUSTRIES

(*Continued from page* 90)

Machine Tool Builders Stress More Education

Education, in the broad sense, is important and essential in the machine tool industry. It was the overall theme of the 57th Spring Meeting of the National Machine Tool Builders' Association.

More specifically, the thinking is that more attention should be given to education of the general public, employes and communities, and students—as well as Government, customers, and industry members—on the basic economics of the machine tool industry and how they represent a national problem.

The meeting, held in Detroit April 30-May 1, had the largest attendance at any of NMTBA's spring meetings. More than 400 representatives of member companies, Government, and industry were on hand. The big attendance reflected, in part, the growing interest in the international aspects of the machine tool business—which have introduced serious problems to the American sector.

Foreign competition, depreciation, communication, community relations, and plans for the 1960 Machine Tool Exposition were among the subjects discussed on the two-day program. Another outstanding feature was the premiere showing of the Association's new motion picture "One Hoe for Kalabo"—a well-done presentation put together to demonstrate to the public the important part played by machine tools in everyday living.

Foreign Competition

In his address as president of the Association, Ralph J. Kraut, president of the Giddings & Lewis Machine Tool Co., bluntly said the Americans are pricing themselves out of the market and warned that unless the inflationary wage-price spiral is corrected, the U. S. will no longer be the leading manufacturing country in the world.

Foreign wage rates, especially in Europe, are anywhere from one-quarter to one-fifth of ours, he said, and foreign technology "in a great number of areas has reached or exceeded ours." Consequently, some American manufacturers cannot produce at competitive prices—and are losing a larger and larger share of both export and home markets, particularly where products are not being made in any quantity.

Mr. Kraut expressed, as his personal opinion, the feeling that four major steps should be taken to correct the situation:

(1) Halt inflation in the entire American economy—by convincing labor it cannot ask for increases beyond the gain in productivity, by inducing Government to adopt sound fiscal policies which will stop the inflationary trend, and by getting the general public behind an anti-inflation campaign.

(*Turn to page* 132, *please*)

TOOL CONTROL SYSTEM

Now, from Seibert, you can obtain tool control boards that are individually designed to suit your production requirements. Panels are subdivided into sections for each type of tool, and divisions are arranged as required with space for two sets of tools for each job. Tool panels and benches are available in 3, 6, 9 or 12-foot lengths. In addition, you can now obtain from Seibert pre-setting gages of all types and also optional equipment such as plastic cyclometer covers with locks, drawers, shelves, etc., to suit your specific needs.

INCREASES PRODUCTION EFFICIENCY

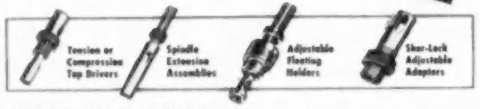
Tool Control Boards are a tested and proven method of increasing the efficiency of production machine tools. They provide a system of scheduling tool changes according to pre-determined efficiency standards. You cut down-time, insure longer tool life, reduce tool breakage, and lower scrap losses.

SUMMARY OF ADVANTAGES

- Reduces down-time, provides an efficient system of programming tool changes.
- Automatically controls machining operations; provides visual record of used life of each tool.
- Assures more efficient use of tools, reduces breakage and scrap losses.
- Provides storage and complete facilities for presetting tools at the machine.

WRITE FOR COMPLETE DATA

Get the complete story on new Seibert Control System. Specify circular B-10, or ask a Seibert Sales Engineer to survey your needs.



SEIBERT

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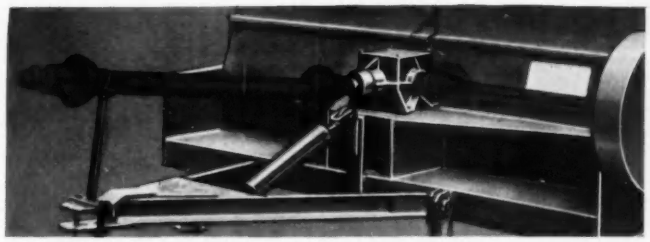
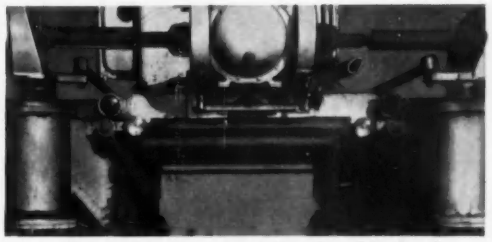
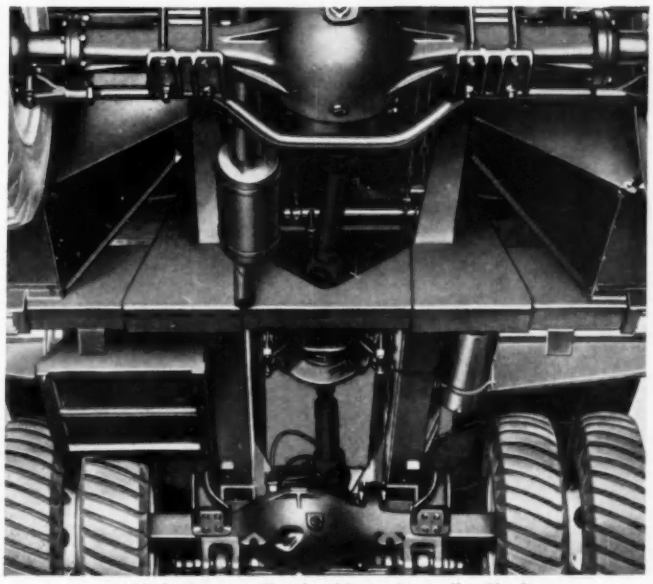
QUALITY MULTIPLE DRILL SPINDLE AND PRODUCTION TOOLS



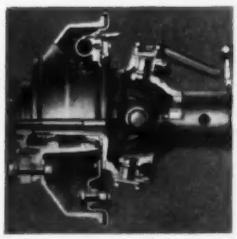
Shielded Farm Implement Drive, Tractor P.T.O. to Gear Box



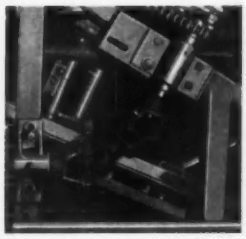
Differential to Drive Sprocket, Straddle Truck



Mobile Crane, All-Wheel Drive Propeller Shafts



Jointed Front-Driving Axle



High Angle, Double Joints

Road Grader, Detachable Belt Conveyor Drive

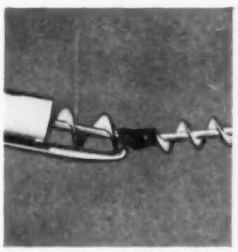
POWER TRANSMISSION PROBLEMS SOLVED

with Blood Brothers U-Joints

Rockwell-Standard engineers see—and help *solve*—a tremendous variety of problems involving a need for universal joints. Applications range from manual steering assemblies...to power take-off drives...to heavy duty propeller shafts.

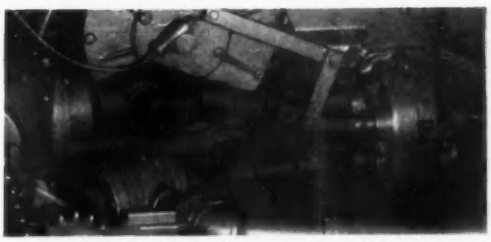
To "get the power through," Blood Brothers Joints are built in the widest range of types and sizes. This range, plus application experience, can be valuable to you. Whether you want to "take power around corners"...or allow for possible minor misalignments—you can call on Rockwell-Standard engineers.

They'll cooperate to save your staff's time—on common or unusual power transmission problems.



Jointed Screw Conveyor

Tractor Steering Assembly



Transmission P.T.O. Drives Pump and Gear Box

ROCKWELL-STANDARD CORPORATION

Blood Brothers Universal Joints

ALLEGAN, MICHIGAN

For general information, request our Bulletin 557

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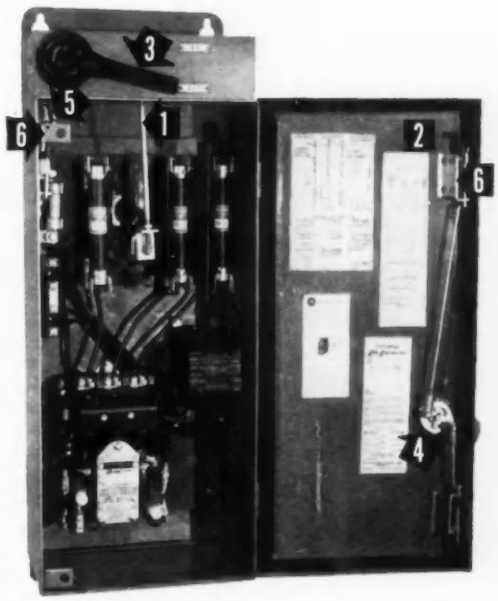
Westinghouse with six

develops new motor starters "monkey proof" safety features

Westinghouse NEMA 12 Life-Line combination starters end unauthorized tampering, offer greater safety and convenience to service personnel

Check these six great new safety "firsts"...



1. The disconnect is permanently attached to handle. On-Off handle is not disengaged by opening the door.
2. Door must be fully closed and sealed before On-Off handle will operate disconnect. (See point 5, below.)
3. Operating mechanism can be padlocked to prevent operation.
4. Door opens simply, easily with tool (screwdriver). Cannot be opened with bare hands alone.
5. If desired, On-Off handle and disconnect can be operated with door opened. To operate, simply depress safety release.
6. Interlock assembly will not allow door to be opened while handle is in ON position. Removing spring from assembly will permit this if desired.

J-30273

. . . plus these extra important features, at no extra cost!

- NEMA 12 dustproof enclosure meets all JIC and other heavy industry specifications.
- Molded nylon handle for increased impact strength.
- Provision for padlocking door and handle.
- Tilted top to drain liquids away from door seal.
- Adjustable tie-rod between handle and disconnect to allow either switch or circuit breaker.
- Available in four standard sizes, from 1 through 4.
- Adequate internal wiring space.
- Extra space for third and fourth overload relays and excess capacity transformer.
- Auxiliary contacts can be field mounted in Visi-Flex* disconnect switch.
- All parts and complete panel removable from front.
- Components available for custom panel construction.

Call your local Westinghouse representative or distributor now, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

*Trade-Mark

YOU CAN BE SURE... IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Circle 177 on Inquiry Card, for more data

(*Continued from page* 128)

(2) Balance the Government budget, eliminate foreign give-aways, cut taxes so that more funds will be available for venture capital, and revise the out-dated tax depreciation policy.

(3) Provide some kind of temporary protection for American industry, in the form of tariffs, quotas, licensing or similar measures.

(4) Drop our complacency, and get to work.

1960 Machine Tool Exposition

The 1960 Machine Tool Exposition was termed "the greatest educational project undertaken by this Association" by D. H. McIver, chairman of the Exposition committee and vice-president, industrial sales, Ex-Cell-O Corp.

He explained it "will be a sweeping working exhibit of all the latest advances in the art of cutting and shaping metal . . . demonstrating a wide variety of new methods of making better parts for more persons at less cost" . . . and that it will give "an advance look at what 40 per cent of American industry will be doing in the next few years."

The Exposition is scheduled to open in Chicago's Amphitheatre, Exposition Hall and Donovan Hall on September 6, 1960, and will run through September 16, 1960.

Mr. McIver said it is not too early for the machine tool builders to start planning for publicizing the Exposition, and that definite action along those lines will begin next January. He reported the committee has under consideration such items as the formulation of an Exposition slogan "which will center on the scientific - educational aspects," and a direct mail campaign. Meanwhile, Horton, Church & Goff, Inc., Providence, R. I., has been selected to handle the overall promotional activities.

He urged the active participation of all member companies in encouraging the attendance of key men of metalworking companies, including middle-management men and foremen; financial executives; educators; Government officials; Congressmen; and overseas visitors. He also suggested that builders "broadcast" the Exposition, at the appropriate time next year, by such media as letters, personal contacts, company publications, stickers on letterheads and sales literature, and insertions of the Exposition slogan in ads, among others.

Depreciation

"Keeping People in Government Informed — Depreciation," was the subject of a talk presented by N. M. Forsythe, president of the National Automatic Tool Co., Inc.

He contended that "one way for American industry to keep ahead of foreign competition is to maintain the most modern production equipment—and American industry

FOR DEPENDABLE *All Weather* COOLING

Install
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RADIATORS

Over 30 years of specialization and engineering research have produced a radiator and core proved dependable under all conditions.

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- ***ALL-COPPER CORES and TUBES*** double-lock seamed give greater strength and eliminate danger of rusting
- 1-piece upper-and-lower-tank brass stampings for **POSITIVE PROTECTION FROM LEAKAGE AND VIBRATION . . .**
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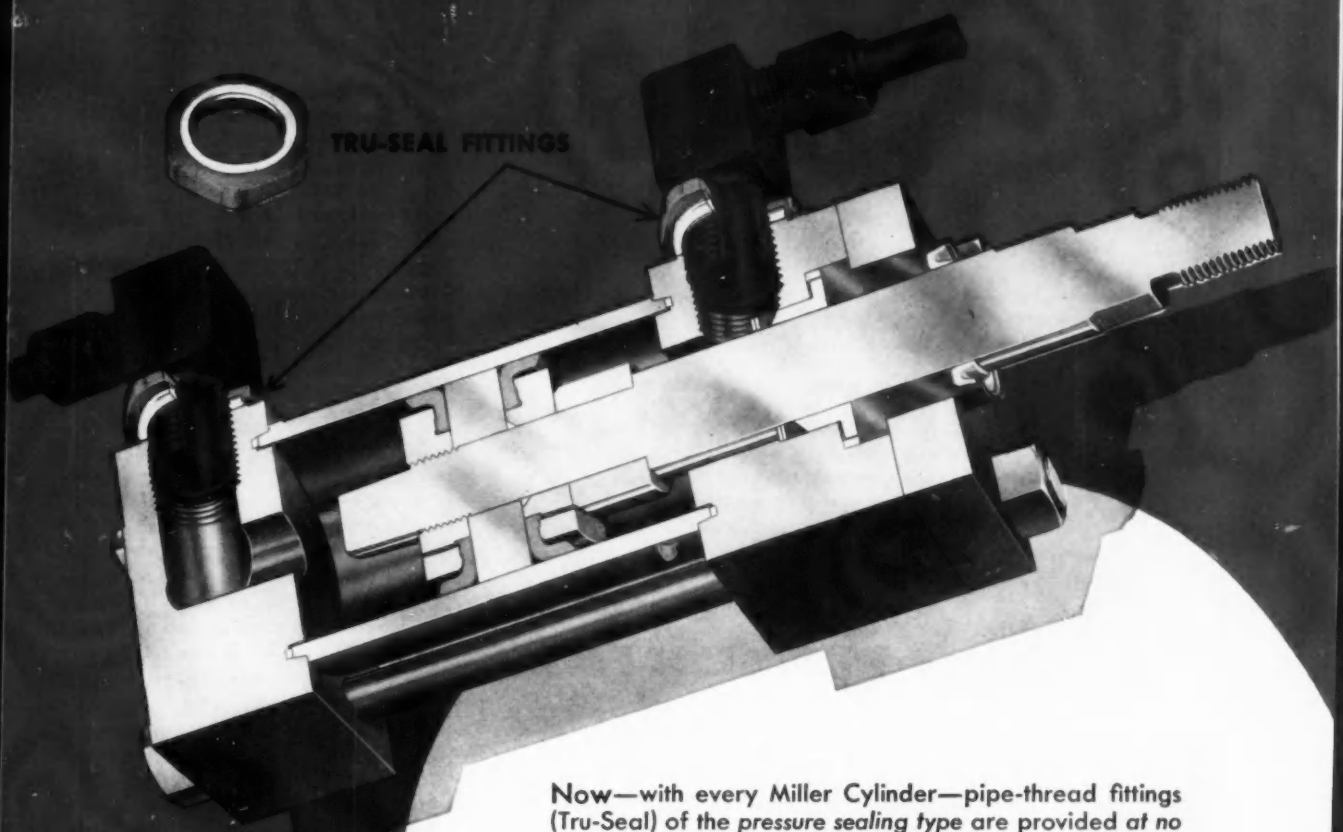
NOW... even the PORTS have seals of the PRESSURE SEALING TYPE!

(J.I.C. Standard H6.2.2)



Now—with every Miller Cylinder—pipe-thread fittings (Tru-Seal) of the *pressure sealing type* are provided *at no extra cost* for sealing the cylinder ports.

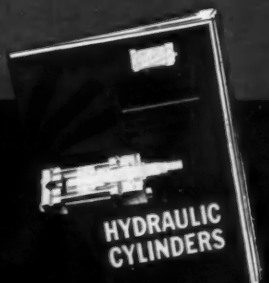
Additional advantages of these fittings are:

1. All circuit piping and fittings can be easily positioned.
2. Damage to equipment caused by high tightening torque is completely eliminated (especially on valves, pumps, etc.)
3. Sealing material is Teflon, which is compatible with all hydraulic fluids (J. I. C. Standard H6.2.1)

Specify

Miller

For Greater Reliability



Engineering Bulletins on Miller Air and Hydraulic Cylinders Available on Request

MILLER FLUID POWER

DIVISION OF FLICK-REEDY CORPORATION

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AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS

new tubing bulletin

for designers and engineers

BULLETIN
FREE
weight savings and physical advantages of tubing for shafting, structural members, and mechanical parts

may help you save up to 50% in steel cost by comparing the weight savings of hollow tubing versus solid stock.

By replacing solid rod with tubing in shafting (2¼" O.D. x .134" wall) a large blower manufacturer effected a 50% savings in costs. Physical performance remained unchanged. Perhaps you, too, can effect comparable or even greater savings. Write today for this free and important table to reduce steel costs!

STANDARD

THE STANDARD TUBE COMPANY and
MICHIGAN STEEL TUBE PRODUCTS DIVISION
24400 Plymouth Road • Detroit 39, Michigan

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LET H&K PERFORATED MATERIALS

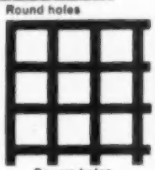
put personality into your products

Round holes

Whenever—wherever—your products require perforated materials, you will find the pattern and open area "just right" for that custom-look in the vast selection of H & K existing dies.

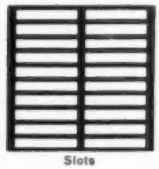
Modern facilities and H & K experienced craftsmanship, enable the perforating of practically all metals, wood, compositions and plastic. Perforated materials can be furnished in sheets, coils, rolls or plates. Fabricating services include shearing, rolling, welding and forming.

Illustrations shown in reduced size



Square holes

Herringbones



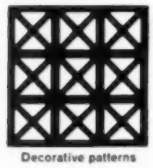
Slots

Oblong holes

Functional or Decorative Uses

H & K fills every need for perforated materials. Appropriate perforated metals can be ordered with color anodized, brushed and lacquered, painted, chrome plated, baked-on, or other special finishes.

Many patterns in steel sheets (industrial or decorative) are in stock at our warehouses. Send for H & K Stock List Brochure.



Decorative patterns

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cannot afford to continually invest in the most modern equipment without at least as good charge-off opportunities as are enjoyed in Europe." He went on to say that this means "present laws and regulations have got to be changed—and of course the only way to change laws is to convince the people in Government that they should be changed."

Mr. Forsythe compared our tax depreciation setup with those in effect in foreign countries, giving specific examples to illustrate how the foreign systems, by shorter write-off periods and special depreciation allowances, serve as incentives to modernization.

"We have before us," he said, "a vital job of communications to our people, to the press, to the business magazines, to machine tool users, and to our Government" . . . to "get the job done."

Tools for Schools

Chester B. Lund, director, Field Administration, Department of Health, Education and Welfare, reported on latest developments in the "Tools for Schools" program.

During 1957, 1700 machine tools were allocated. In 1958, the total was 7500. In 1959 to March 31, 2505 machine tools were allocated, an increase in rate of 35 per cent over the last quarter of 1958.

The speaker said "we still have much to do to get the full advantage of this activity into the educational field"—and requested continued support of machine tool industry members in working with the schools to assist educators in planning their shop layouts, training programs, and equipment needs.

Around the Industry

Warner & Swasey Co. — has joined Asquith Machine Tool Corp. Ltd. of Halifax, England in forming a new company to be called Warner Swasey Asquith Ltd. and to be located at Halifax, England. W&S will license the new company to manufacture single-spindle automatics to W&S designs for sale in European markets. Initially they will be built in Asquith's present plant, later in separate facilities to be provided.

(*Turn to page* 144, *please*)

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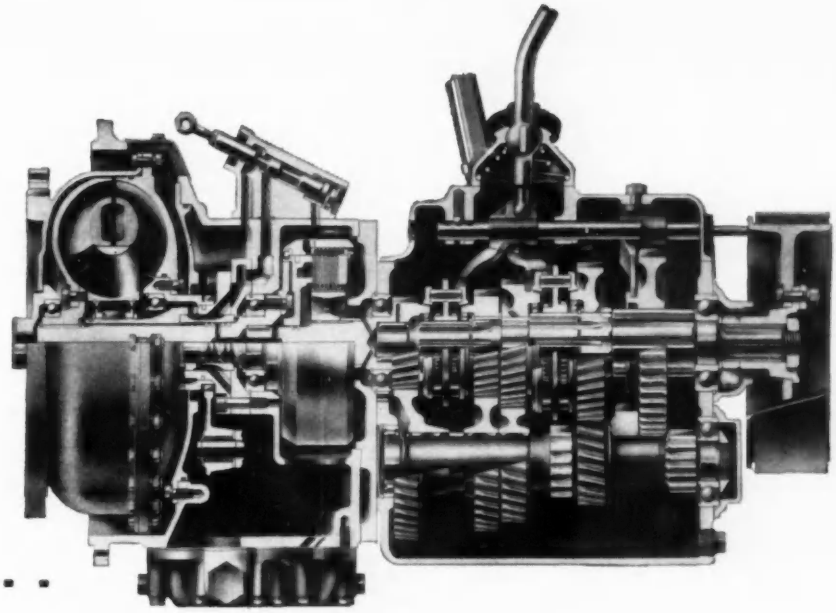
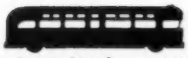
No more "tired left foot" and down come costs . . .



with a CLARK *TRANSVERTER*

Trucks Operating on delivery schedules



Coaches making frequent stops

Refuse collection

Concrete mixers and similar industrial applications

Materials handling machinery

Many stationary power plants and oil field applications

. . . Combines the smoothness of a torque converter, hydraulic disconnect clutch, and synchronized transmission—in a compact, rugged package. Ideal for vehicles in "frequent start" service

No heavy clutching—
Hydraulic clutch of on-off type. Effortless control by push-button or light-pressure pedal

Gear shifting greatly reduced—
Closely spaced ratios—gear changes are fast and smooth

Fine inching control—
Torque converter provides smooth power flow, controlled by accelerator

Smooth starts, swift pick-up—
No engine stall, no lugging, no wheel-slipping—less tire wear

Longer life for drive-train—
No shock-loading. No friction clutch to require adjustment. Far less down-time

Ideal accessibility—
Easiest possible service with no need for special tools

Available for OEM or field conversion—
These exceptional superiorities add up to this certain result: FASTER, EASIER, MORE ECONOMICAL OPERATION.

For the whole interesting story, send for the TransVerter Bulletin.

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CLARK EQUIPMENT COMPANY, Transmission Division, Falahee Road, Jackson 2, Michigan
Please send the TransVerter Bulletin

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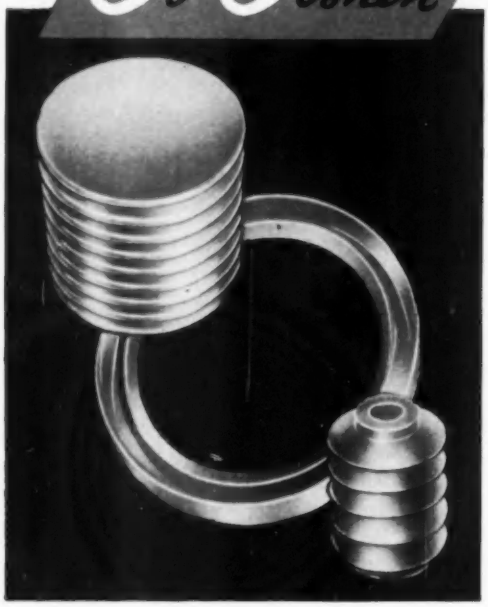
For High and Low Temperature needs in

SILICONE

RUBBER SEALS, PARTS, COMPONENTS

Go Goshen



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LATHE CUTTING • BONDING-TO-METAL

Goshen-developed silicone rubber compounds assure parts with properties like these:

- Resistance to temperature extremes of —80°F to +500°F.
- Resiliency over a range of —120°F to +600°F.
- Low compression set.
- Resistance to chemicals, oxidation, ozone, moisture, corrosion, shock, abrasion.
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To learn for yourself why more and more design engineers "Go Goshen" for silicone rubber parts, write, wire or phone.

Goshen Rubber Co., INC.

2759 S. TENTH ST. GOSHEN, INDIANA

Ford Sharonville Plant

(*Continued from page* 57)

and finish-reaming of the valve bores, and finish-milling of five small flat areas. Station 4 drills, in order, the larger holes—5, 6, 1, 3. Stations 6 and 7 rough-ream, in order, the following holes—7, 1, 3, 5, 6, 2, 4. The same holes then are finish-reamed in order at Stations 9 and 10. Station 11 is an automatic gaging station with air spindles for checking this group of reamed holes.

When the work reaches Stations 15 and 16 the five flat areas previously rough-milled are finish-milled. The valve bodies then are washed with coolant and blown off. Incidentally, it is noteworthy that the second Heald unit (Operation 40) uses a mineral seal oil for the cutting fluid on all finishing operations.

Some additional process takes place after the parts have completed their cycle in the Heald line. First of all each of the large bores is individually gaged with a ball jet spindle, most of the holes being held to a total tolerance of 0.001 in. Bodies are put through a washer, racked, and transported through an anodizing machine. Following this they are loaded in special fixtures and go through complete deburring in a Pangborn through type Maizo Blast unit. Parts are washed once more and go through a cycle in a through type Micromatic lapping machine to finish lap the large milled face. This is an exacting operation since the face must be flat within 0.0003 in. across the extreme diagonal edges of the part.

After the entire sequence of operations has been completed the parts are subjected to 10 per cent re-inspection of the large bores. In addition to gaging for size, sample checks are made with a portable Profilometer to verify the desired degree of surface finish. ■

Design of the Mighty-Mite

(*Continued from page* 59)

turing generally required in vehicles. The floor of the body is made exceedingly strong through the use of embossed details plus the box shape in the form of hat, channel, and double hat box sections.

A very unusual use of the box section is found in the splice joining the cargo area and cab. Here the two body units are joined by overlapping and nesting of details. This particular box section provides a protected conduit for the electric wiring from the engine to the rear of the vehicle.

The tailgate of the Mighty-Mite has to be sufficiently strong to withstand the heavy pressure from loads carried in the cargo area and provide a secure anchor for two jump seats. The problem was aggravated by the fact that the specifications called for the two seats, plus the back rest, to be storable within the 1½ inch overall thickness of the tailgate without the use of loose components. Some 160 details go into the tail-

(*Turn to page* 140, *please*)

Circle 183 on Inquiry Card, for more data

One in a series of technical reports by Bower

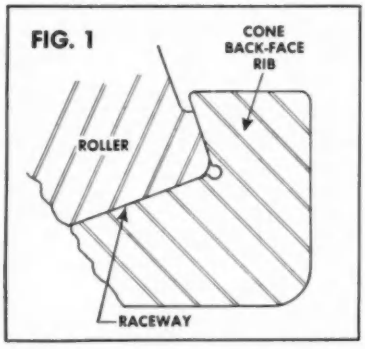
BEARING BRIEFINGS

BEARING GEOMETRY MAKES OR BREAKS BEARING PERFORMANCE

To develop high capacity and optimum performance in a tapered roller bearing, it is essential that roller alignment be accurate. Correct roller alignment, in turn, depends on a critical geometric relationship between the cone back-face rib, and the cone raceway.

Perfection in this geometric relationship compels the rollers to align themselves perfectly with respect to the bearing geometry, and each roller shares equally in the work that is imposed. Figure 1 diagrams the important elements involved.

When this rib-to-raceway relationship is incorrect (because of either faulty bearing design or manufacturing inaccuracies), rollers experience misalignment and begin to skid and skew under



load. As engineers know, poor performance and premature bearing failure are inevitable under these conditions.

In the design and manufacture of Bower tapered roller bearings, Bower engineers take great care to generate and hold an exact face angle on the cone back-face rib. In practice, this means that Bower

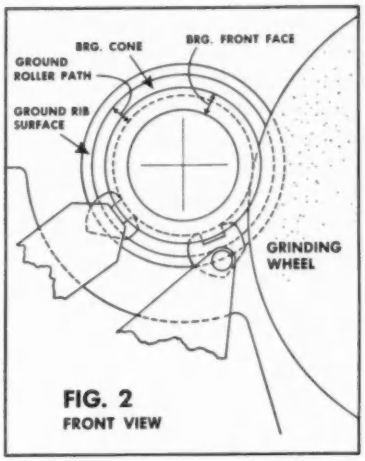
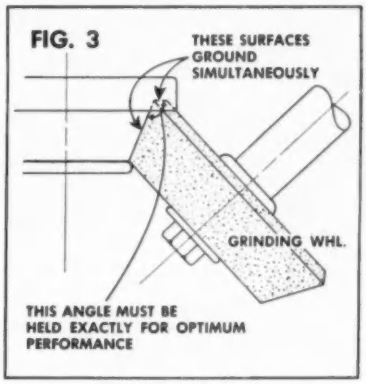


FIG. 2
FRONT VIEW

bearings are designed for maximum life and optimum performance under any operating conditions. It means that Bower bearings retain accurate roller alignment under all speeds and loads up to the maximum for which the bearing is rated.

It's one thing to develop proper bearing design on paper, but quite another to carry it out consistently in manufacture. To this end, Bower engineers were instrumental in the design and development of a unique centerless grinder on which Bower precision grinds each bearing's cone raceway and rib-face simultaneously. The results obtained from these machines invariably meet or surpass Bower's exacting requirements and assure perfect roller alignment.

Figures 2 and 3 are front and side views which illustrate Bower's technique of centerless grinding rib-faces and cone raceways together. As a result, every component in a Bower bearing is perfectly concentric about its rolling axis.



★ ★ ★ ★

When you require bearings, we suggest you consider the advantages of Bower bearings. Where product design calls for tapered or cylindrical roller bearings or journal roller assemblies, Bower can provide them in a full range of types and sizes. Bower engineers are always available, should you desire assistance or advice on bearing applications.

BOWER ROLLER BEARINGS
BOWER ROLLER BEARING DIVISION — FEDERAL-MOGUL-BOWER BEARINGS, INC., DETROIT 14, MICHIGAN

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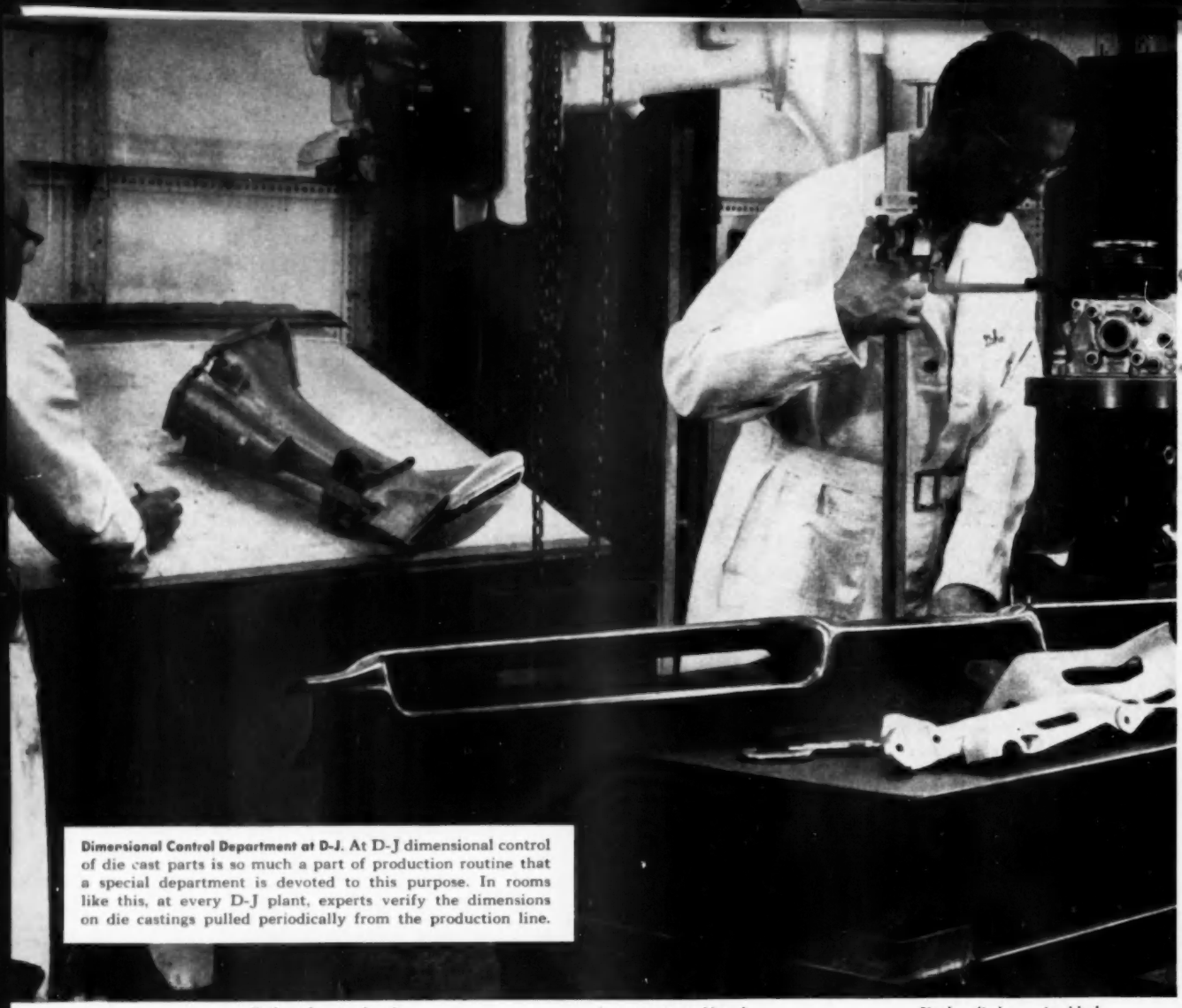


Dimensional Control Department at D-J. At D-J dimensional control of die cast parts is so much a part of production routine that a special department is devoted to this purpose. In rooms like this, at every D-J plant, experts verify the dimensions on die castings pulled periodically from the production line.

Outboard motor housing | Instrument panel bezel | Single cylinder engine block | Pinspotter part

At Doehler-Jarvis . . . everything improved production methods

Automatic transmission parts illustrate how much can be done with die cast design. Notice the ganged fluid passageways. Not apparent, but incorporated into the design of each of these parts, are many features that make these parts usable much as they are . . . with a minimum of further manufacturing needed.

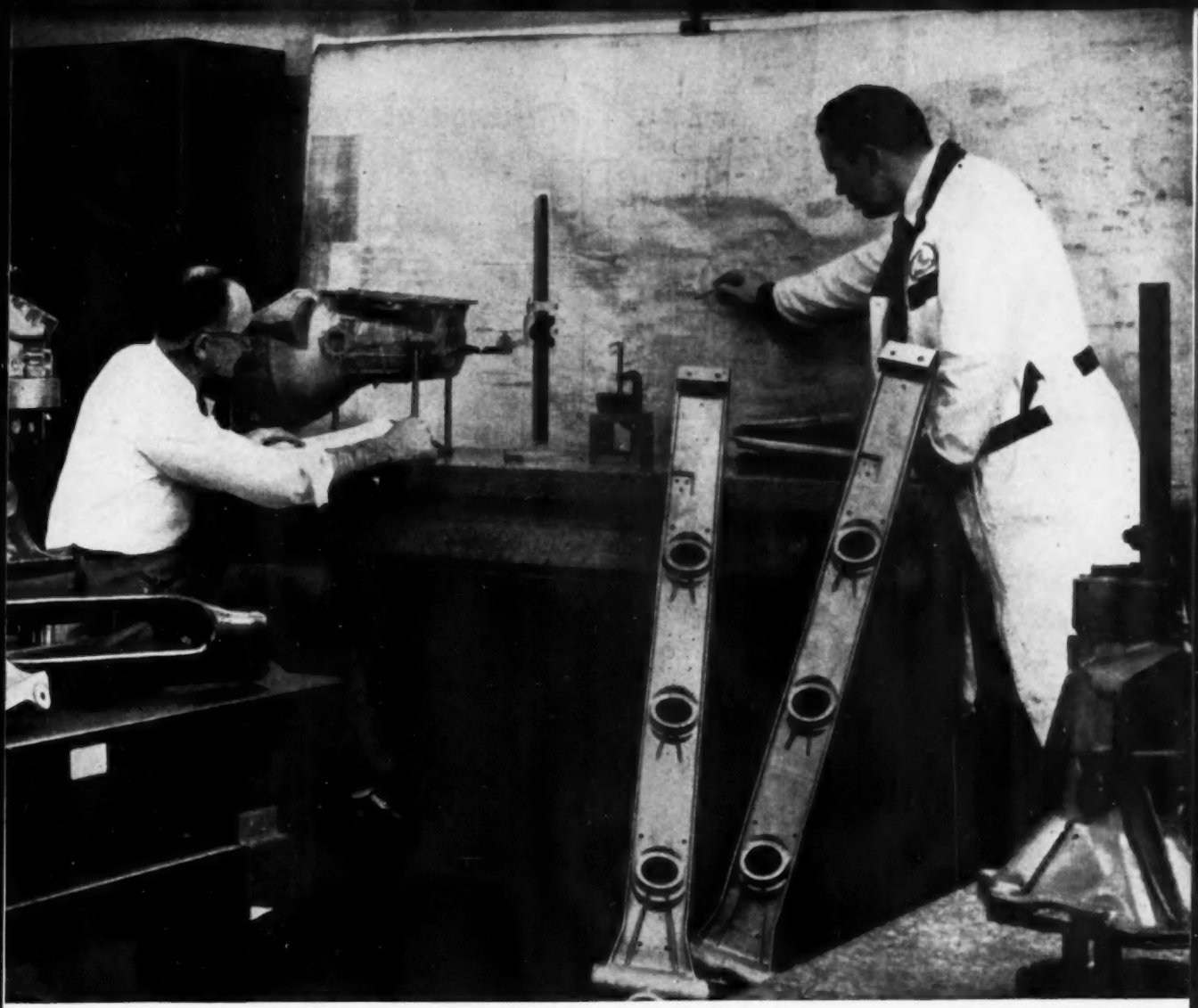
Only a handful of companies have ever taken *full* manufacturing advantage of the inherent opportunities presented by the purchase of die castings — opportunities to so design parts that production *all along the line* is simplified, speeded up, and made more economical.

Frequently die castings are bought under conditions where price is the dominant competitive factor. This approach sometimes makes good purchasing sense. And on the basis of price competition Doehler-Jarvis produces and sells more die castings per year than any other custom die caster.

But there is another, and often more rewarding, way to look at the purchase of die cast parts.

In many instances — most, in fact — a careful analysis of the part by experienced metal production men working in close coordination with equally experienced designers of the dies and the castings reveals ways to:

(1) reduce cost or improve performance of the casting itself.



Transmission housing | Pinspotter arms | Transmission part

needed to help you develop with the help of die castings

(2) introduce design features that eliminate one, many, or all of the machining, finishing or sub-assembling operations that must be accomplished before the part can be incorporated into the end product.

For example. Product engineers have only begun to realize the full range of applications made possible by the high fatigue strength inherent in aluminum die castings . . . by integrating several separate parts into one die casting . . . by ganging fluid passageways (as in automatic transmission designs).

Doehler-Jarvis customers who have taken this suggested broad viewpoint in purchasing their die castings find it pays off . . . sometimes enormously.

No producer of die castings can contribute more to this broad purchasing concept than Doehler-Jarvis.

In any category you care to name . . . research support . . . design help . . . skilled workmanship . . . versatility of metal working equipment (you can even buy *forgings, extrusions and stampings* from D-J) . . . sub-assembly facilities . . . choice of die casting metals and alloys . . . location of plants . . . delivery . . . Doehler-Jarvis provides more facilities than any other producer of die castings.

See what Doehler-Jarvis can do to help you realize the full potentials in die cast parts production. Call us in at an early stage in the design of your next new product or model change.

Doehler-Jarvis

Division of

NATIONAL LEAD COMPANY

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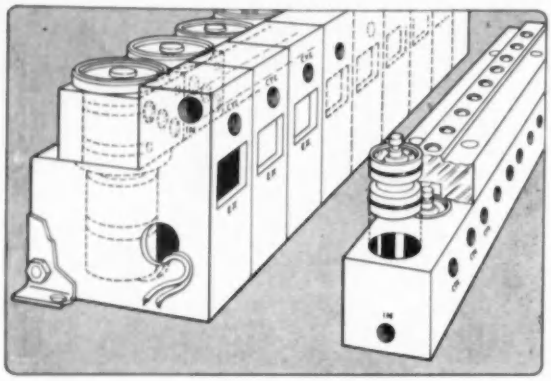
In Canada:

Barber Die Casting Co., Limited

Hamilton, Ontario

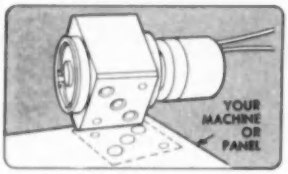


New Humphrey "Stack-Pack" Electric Manifold Valve. May be used singly or in multiples. Valve mechanism easily removed from manifold. Single inlet port for multiple installations.

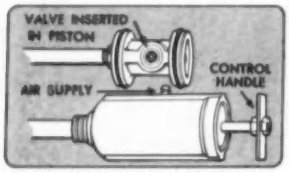
Humphrey Exclusive! Manifold using Insert Valves. Just the internal mechanism of valve may be inserted in your manifold. Manual, cam or pilot operated.

HUMPHREY "Quick-Dump" VALVES

give you greater capacity—smaller size—faster action—more versatility and simplicity of design



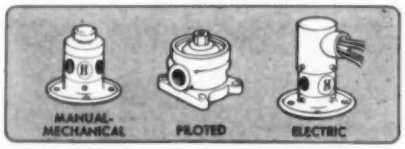
This may be the valve you need! Square bodied Electropact or piloted valve with all porting on one side to mate with drilled air* passages in your product, or—mount on panel with all porting on one side. Greatly simplifies installation.



For original equipment, "Quick-Dump" Valves offer outstanding advantages. This customer's air cylinder is operated by two Humphrey Valves inserted in piston itself! A turn or pull of handle controls piston travel.

OFFERED IN THESE BASIC TYPES—

ACTUATED BY ANY OF THESE METHODS—



***FOR AIR, WATER, OIL, GASES—TO 125 PSI**

⅛" delivers 30 CFM at 100 PSI • ¼" delivers 80 CFM at 100 PSI • ½" delivers 275 CFM at 100 PSI • Dead seal shut-off. Temperatures from -65° to 225° F. 2-3-4 way—⅛", ¼", ½" sizes. Write for engineering assistance on your valving problems.

SEND FOR BULLETIN 202-D

Humphrey Products

DIVISION OF GENERAL GAS LIGHT COMPANY "The Heart of Automation"

202 N. PARK ST., KALAMAZOO, MICHIGAN

Pneumatic-Hydraulic Valves and Devices

Design of the Mighty-Mite

(*Continued from page* 136)

gate and its jump seat assembly.

A good deal of weight was eliminated, and manufacturing substantially simplified by minimizing the number of components on the body. The basic design, for example, called for four reflectors, one on the corner of each wheel well. Rather than add a ring holding unit, the engineers decided to indent the metal while forming the flanges, thus making the holding unit an actual part of the wheel well. This type of simplification is used in several other parts of the vehicle including the cowl windshield attachment and the sill section. The body was completely lofted and the components were perforated before forming. The accuracy attained in this phase of manufacturing is attested to by the fact spotweld assemblies are made without the use of fixtures. Components are preassembled with Cleco pins which accurately register adjacent details by picking up lofted holes. After spotwelding, the pins are removed and the holes are filled with rivets. ■

Indianapolis Race

(*Continued from page* 63)

hood for better streamlining. At the same time, he puts more weight on the left side for the high speed turns.

Casale says his car will measure 23 in. high at the front axle, 36 in. at the rear.

Precious seconds in the pits may win or lose a race. The two-time winner, Belond-AP Muffler Special, will come to the track with a sensational feature. Builder George Salih has installed a self-contained air-jack system to raise the entire car off the ground in one-half second.

Salih believes he can save up to seven seconds in each pit stop. The Belond pit crew already holds the Indianapolis pit stop record of 27 seconds—now hopes to reduce this time 25 pct.

Here's how the air-jack system works: When the car slides into the pit and stops, an air hose will be quickly coupled into a fitting on the car. In a split second, all four wheels will be 1½ in. off the ground —ample clearance for a fast tire change.

Until now, just jacking the car in the pits took three men, one in front and two at the rear using hand-operated jacks.

Some while back, a car came to the track with a self-jack system. But as yet no car ever used one during the race.

The Belond Special has new Halibrand front wheels with balancing wheels both inside and outside. In the past, there were weights only on the outside.

Another modification of the car: a double rear bumper of two heavy chrome steel tubes wrapping around entire rear end. The bumper is designed to keep an oncoming car from climbing up and over the rear of the car. ■

Circle 186 on Inquiry Card, for more data

OLIN
ALUMINUM
GLISTENS
ON
AMERICA'S
FINE
CARS

Brown-Lipe-Chapin Division, General Motors Corporation, fabricates this grille.

OLIN MATHIESON, METALS DIVISION, 400 PARK AVENUE, NEW YORK 22, NEW YORK.

In the automotive industry alone, there are 30 Cold Bonderite installations.

How Cold Bonderite System cuts costs

Some actual user-experiences of savings in heat requirements, maintenance, water and electricity, and equipment after installing Cold Bonderite System.

Less than two years ago, the first public announcement of Parker's Cold Bonderite System was made.

Now, well over a hundred plants are using this revolutionary, money-saving system of phosphate-treating at low temperatures.

Some are among the country's largest plants, others are quite modest in size and production. Products treated range the list from automobile bodies to small appliance components.

From these users we have compiled a long list of documented savings records. In many cases, cost reductions have been greater than we had hoped to achieve.

The temperature tells the story! Cold Bonderite System solutions operate 60° to 75° cooler.

Heat Saved

The greatest percentage savings in heat requirements (90%) has been reported by an automotive plant. Before installing Cold Bonderite System, the finishing line used 50,000 pounds of steam an hour. Cold Bonderite in the line uses only 5,000 pounds per hour.

In another auto plant, heat savings are figured at 74% on a body line. A small parts finishing line in the same plant shows the same percentage reduction in heat requirements.

A manufacturer of metal cabinets reduced gas consumption for heating his phosphating line from 33,000 to 14,000 cu. ft. per day—a 56% reduction—by installing the Cold Bonderite System.

A famous maker of household equipment changed from conventional phos-

phating to Cold Bonderite System and saw his steam use plummet 66%.

Another manufacturer, an Eastern small appliance maker, reports that on gas expense alone he has cut his phosphating costs 45%.

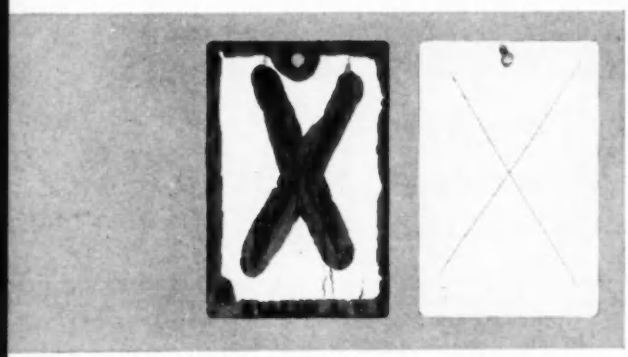
Other Savings Pile Up

The magnitude of other savings, beyond heat consumption, has been surprising to users and very good news to their cost accounting departments.

Electricity, for instance. At the greatly reduced temperatures of the solutions, there is no need to operate exhaust fans. In one installation, the change to Cold Bonderite eliminated the need for replacing a $15,000 exhaust system.

Water use is reduced about 25% because there is less evaporation.

Maintenance costs nosedive with Cold Bonderite System in the finishing line. Lower temperatures in the heating coils mean less frequent—or no necessity for—cleaning the coils. When there is service to be performed, the maintenance crew can move right in without waiting for the installation to cool off.



Comparative 48-hour salt spray test proves performance. Left, untreated panel; right, panel Cold Bonderite-treated before painting.

One user figures that he has eliminated 364 manhours of maintenance time yearly with his Cold Bonderite System.

The same manufacturer has discovered, too, that the reduced temperatures have allowed him to eliminate a number of steam traps and steam coils costing over $8,000.

Coating Quality Is High

While Cold Bonderite System is saving money on the phosphating line in these many ways, there has been absolutely no diminution of quality in the coatings or their performance.

The Bonderite coating produced by low-temperature Cold Bonderite System matches the high standards set by Bonderite for thirty years. In salt spray, humidity and outdoor exposure tests, as well as in actual service on automobiles, appliances, furniture and many other products, performance has been proven.

Results are uniform hour after hour and day after day. Control and operation of the system is simple and practically foolproof.

Chemical Costs Held Low

All the savings attained by the use of Cold Bonderite System are *real* savings. They show up on the P & L statement because *chemical costs for this revolutionary development are not increased.* The special Bonderites and Parco Cleaners are strictly comparable to conventional hot treatments in the cost of treatment per square foot.

Only Parker Has Cold System

There is, actually, no other system like it. Cold Bonderite System was developed by Parker research, tested and perfected by Parker chemists. It has been proven over and over again as the way to get superior phosphate coatings on steel with spectacular savings.

The Parker representative in your territory is ready to advise and work with you to change your phosphating installation over to Cold Bonderite System. Call him in or write direct to Parker, Detroit.

**Bonderite, Bonderlube, Parco, Parco Lubrite – Reg. U.S. Pat. Off.*

PARKER RUST PROOF COMPANY

2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE corrosion resistant paint base | BONDERITE and BONDERLUBE aids in cold forming of metals | PARCO COMPOUND rust resistant | PARCO LUBRITE—wear resistant for friction surfaces | TROPICAL—heavy duty maintenance paints since 188

Circle 188 on Inquiry Card, for more data

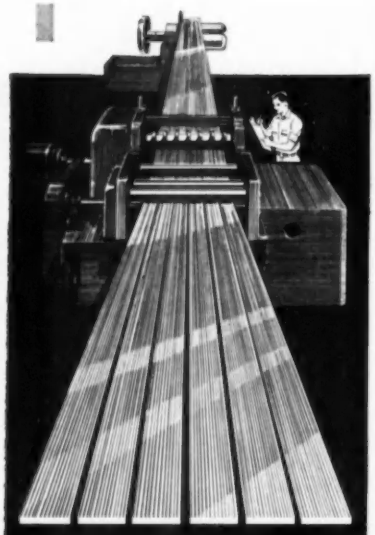
YODER

Rotary Slitters

Product dependability—integrity of manufacture—engineering for specific production needs have all contributed to establish Yoder equipment as the industry standard of excellence. Since 1909 Yoder-built machinery, including Pipe and Tube Mills, Roll Forming Equipment and Rotary Slitters, have earned world-wide customer satisfaction and recognition.

Profit from Yoder's years of engineering and service experience. Send today for the illustrated Yoder Slitter Book.

THE YODER COMPANY
5553 Walworth Ave., Cleveland 2, Ohio



ENGINEERING YODER MANUFACTURING

ROTARY SLITTING LINES
PIPE AND TUBE MILLS
(ferrous or non-ferrous)
COLD ROLL FORMING MACHINES

Circle 189 on Inquiry Card, for more data

News of the MACHINERY INDUSTRIES

(*Continued from page* 134)

Rockford Machine Tool Co.—recently acquired Maplewood Machinery Co. of Chicago, makers of roll-forming equipment, and the Ingels Elbow Machine Corp. likewise of Chicago, makers of power and hand tools for sheet metal work. Manufacturing activities of these companies are being transferred to Rockford, Ill., and will operate as the Maplewood Div.

Vermont Tap & Die Co.—has purchased Pacific Tap Co. of Burbank, Calif. which will operate as a division of Vermont Tap & Die Co., a subsidiary of American Saw & Tool Co.

Beatty Machine & Mfg. Co. — has bought from the Whiting Corp. the Quickwork line of tools which includes stamping trimmers and rotary shears.

Clearing Div., U. S. Industries, Inc. — in enlarging its research and development staff has appointed John Liu as associate director of R&D.

Gardner Machine Co.—Vernon L. Loofboro has been appointed executive vice-president.

Jones & Lamson Machine Co.—Kenneth A. Henn recently assumed the newly-created position of domestic sales manager, with headquarters at Springfield, Vermont. Lewis Bernardini will succeed Mr. Henn as manager of J&L's Detroit office.

F. J. Littell Machine Co.—has announced the appointment of Charles F. Netzler as assistant sales manager. In his new post Mr. Netzler will remain in charge of the Cleveland office and continue his coverage of the Ohio area.

Pivot Punch & Die Corp.—Robert L. Bristol has been named sales manager of the Punch Div. of this company.

Proto Tool Co.—new vice-president of sales is Richard E. Reich. ■

The Right Rubber Part
TO FIT YOUR PRODUCT

Must be: 1. Custom made. 2. The product of a carefully designed die or mold. 3. Developed from properly compounded rubber stocks. 4. Backed by ability and experience gained through a wide variety of industrial applications.

Western serves such diverse industries as communications, electronics, transportation, farming, plumbing, heating, chemistry and pharmaceuticals.

Why not let Western's proven success in these and allied fields help to produce the rubber part you need.

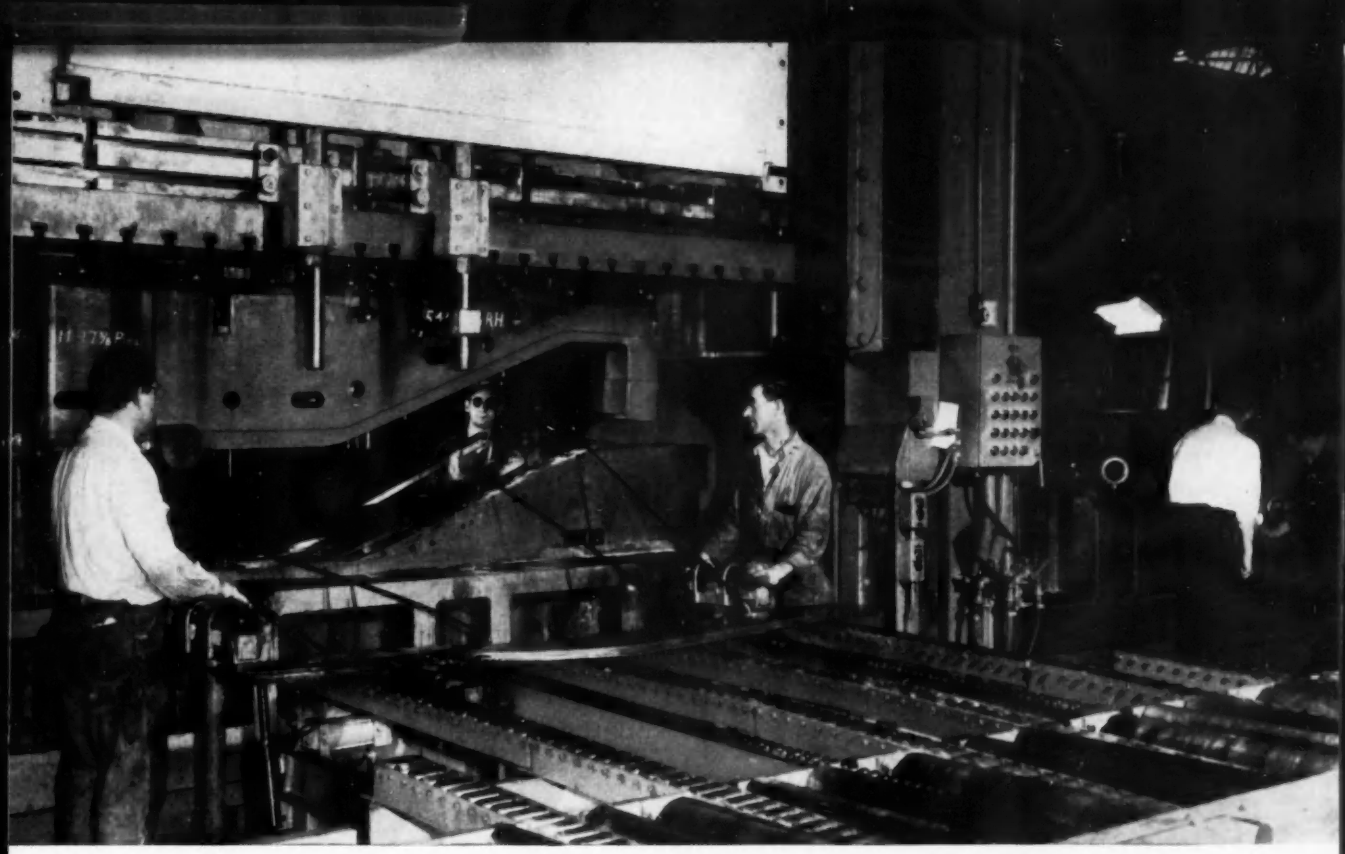
Write or phone for information, literature or a visit by our sales engineer in your area.

SINCE 1902

WESTERN RUBBER CO.
GOSHEN 8, INDIANA

MOLDED AND LATHE-CUT RUBBER PARTS FOR ALL INDUSTRIES

Circle 190 on Inquiry Card, for more data



New design permits tooling up of one bolster *(right)* while press is producing parts from die on other bolster. This press, at the A. O. Smith Corp. plant, in Milwaukee, Wis., is expected to achieve 94% utilization.

Press downtime . . . down from hours to minutes

THE NEW HAMILTON SLIDING BOLSTER PRESS:

- **Reduces parts inventory**
- **Meets changing schedules on time**
- **Cuts number of presses required where die changing is frequent**
- **Eliminates long and costly die setting operations**
- **Provides storage area within press frame**
- **Available in all types and tonnages**

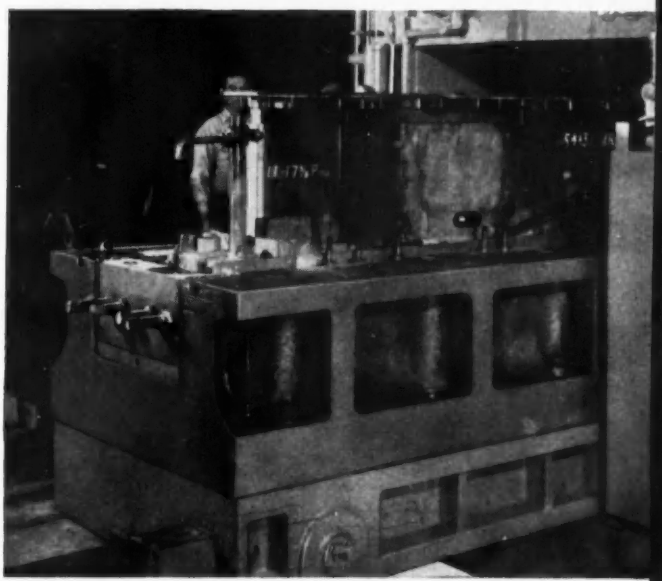
No longer need hours – and sometimes days – be wasted in unproductive press downtime while changing dies for another run. This major step in stamping and forming press room operations is made possible with the Hamilton Sliding Bolster press.

A 1250-ton 2-point, top-drive press equipped with two sliding bolsters recently installed at a Midwest automobile parts plant is proving the economies of the innovation—on parts up to 12 ft. long.

While the press produces parts from a die mounted on its operating bolster, a second bolster can be tooled for the next run. Changeover time is negligible —pushbutton-controlled hydraulic motors quickly and positively position the second bolster for speedy startup and production of the next part.

In the open position, the bolster is clear of the press frame for easy die change and setup. Crane handling of heavy dies is absolutely unobstructed.

For further information, write Dept. 7-E



Pushbutton-operated bolsters slide into place in minutes. Downtime for changing dies is virtually eliminated.

Hamilton Division Hamilton, Ohio

BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools & general machinery

Circle 191 on Inquiry Card, for more data

DESIGN SHOW

Conference Program

(*Continued from page 74*)

MECHANICAL

Co-Chairmen—Francis L. Jackson, technical director, Franklin Institute Laboratories for Research and Development, Philadelphia, and T. R. Rideout, consulting engineer, Port Chester, N. Y.

"Design and Application of Belts, Chains and Gears"

Speakers—E. S. Cheaney, W. C. Raridan and C. L. Paullus, principal engineers, product development division, Battelle Memorial Institute, Columbus, O.

"Clutch-Fluid Coupling-Torque Converter, Application Considerations and Performance Comparisons"

Speaker—Robert W. Bachmann, application engineer, hydraulic division, Twin Disc Clutch Co., Rockford, Ill.

WED. MAY 27 (Concurrent Sessions)

MATERIALS

Co-Chairmen—Dr. E. H. Phelps, assistant division chief, chemical-metallurgy division applied research laboratory, U. S. Steel Corp., Monroeville, Pa., and R. V. Vanden Berg, head, finishes section process development laboratories, Aluminum Co. of America, New Kensington, Pa.

"Latest Development in Materials to Resist Chemical Corrosion"

Speakers—E. Burt Friedl, principal chemist, corrosion research division; Louis J. Nowacki, assistant chief, organic coatings research and William H. Safranek, assistant chief, electrochemical engineering division, Battelle Memorial Institute, Columbus, O.

POWER AND CONTROL

Co-Chairmen—Jay W. Picking, manager, control division, Reliance Electric and Engineering Co., Cleveland, and A. M. Kimball, manager, digital control engineering, director systems department, Westinghouse Electric Corp., Pittsburgh

"Digital Systems for Control Applications"

Speaker—Isaac L. Auerbach, president, Auerbach Electronics Corp., Narberth, Pa.

"Logic Circuits for Machine Control"

Speaker Edgar V. Weir, consulting engineer, Magnetics, Inc., Butler, Pa.

MECHANICAL

Co-Chairmen—Dudley Fuller, professor, mechanical engineering department, Columbia University, New York, and Stanley Abramovitz, president, Continental Bearing Research Corp., New York

"Design Curves for Journal Bearings"

Speaker—Donald F. Hays, research engineer, mechanical development department, research laboratories, General Motors Corp., Warren Mich.

"Which Bearing and Why?"

Speaker—Arnold O. DeHart, research engineer, mechanical development department, research laboratories, General Motors Corp., Warren, Mich.

THURSDAY, MAY 28

GENERAL ENGINEERING

Co-Chairmen—Thomas W. Hopper, president and director, Day & Zimmermann, Inc., Philadelphia, and G. L. Broomell, director of engineering, Leeds & Northrup Co., Philadelphia

"A Graphic Method for Engineering Organization"

Speakers—E. M. Ramberg, vice-president-engineering, and Randolph P. Dominic, assistant to vice-president-engineering, Titeflex, Inc., Springfield, Mass.

"The Man and the Organization"

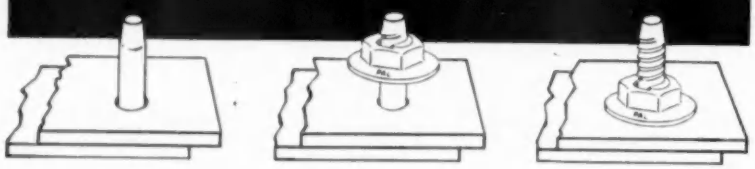
Speaker—Dr. Martin M. Bruce, vice-president and director, psychological services, Clark, Channell, Inc., Stamford, Conn.

SAVE THE COST OF THREADING!

PALNUT Self-threading Nuts

make their own threads while tightening

on zinc die cast studs, plated or unplated; also on rods or wire of steel, brass, aluminum or plastic



Now available in 3 Designs

TYPE ST—WASHER BASE

This one-piece Self-threading nut performs functions of ordinary nut, lockwasher and flat washer. Available in several base diameters; also with bonded-in plastisol compound to seal out water and dirt. Sizes for ⅛", 3/16" and ¼" dia. studs and rod.

TYPE RST—REGULAR HEX

Requires shorter stud or rod space, less seating area. Costs less, assembles as fast as push-type nuts, can be removed and re-used, parts stay tighter. May be used with internal wrench. Sizes for ⅛", 5/32" and 3/16" dia. studs and rod.

Big savings, fast assembly, tight parts are obtained by using low-cost, spring-tempered PALNUT Self-threading Nuts in place of conventional threaded fasteners.

The special PALNUT thread-forming, thread-locking design produces deep, clean threads having high torque and tensile values. The thread-forming teeth exert powerful vibration-proof grip on stud or rod, whether seated or unseated. PALNUT self-threading nuts may be removed and re-used on the same studs.

Assembly is easy and fast with standard tools—extra-fast using PALNUT magnetized wrenches. Millions used monthly on ornaments, mouldings, nameplates and other parts.

NEW!

ACORN TYPE CST

Dome-shaped top covers ends of exposed rods or wire to provide pleasing appearance and protection against scratching. Sizes for ⅛" and 3/16" dia. studs or rod.

Write for free samples and data.

THE PALNUT COMPANY, 60 Glen Road, Mountainside, N. J.

Detroit Office and warehouse:
730 West Eight Mile Road, Detroit 20, Mich.

PALNUT® LOCK NUTS FASTENERS PAL®

Circle 192 on Inquiry Card, for more data

use Airco's new Dip Transfer† *CO_2 Process***

for **ALL-POSITION WELDING OF STEEL IN ALL THICKNESSES**

low costs · easy fit up · high speed · very low spatter · no warpage

In welding mild sheet steel manually, there's only *one way to reduce costs and produce high quality welds* at the same time. Airco Dip Transfer CO_2 Process Welding. Let's be specific: –

- The complete Airco Dip Transfer CO_2 package welds in all positions . . . manually!
- Welds are hydrogen-free.
- Virtually ends warpage – only low average currents are used for burn off.
- Creates little or no spatter.
- Handles typical steel joint fit ups.
- No flux needed.
- Penetrates deeply – critical for high quality.
- Welds much faster than flux-based processes.
- Uses money-saving Pureco CO_2 as shielding gas.
- The basic equipment welds all weldable metals.

The Airco Dip Transfer CO_2 Process gives you consistently *high quality* welds at *lower costs* than any other process. For complete information, phone or write your nearest Air Reduction Representative. Ask for the new 24-page "AIRCOMATIC CO_2 WELDING" Catalog.

Pureco CO_2 is supplied by the Pure Carbonic Company, a division of Air Reduction Company, Incorporated.
†Trademark
**Patent Applied For

AIRCO®

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated

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In Cuba–
Cuban Air Products Corporation

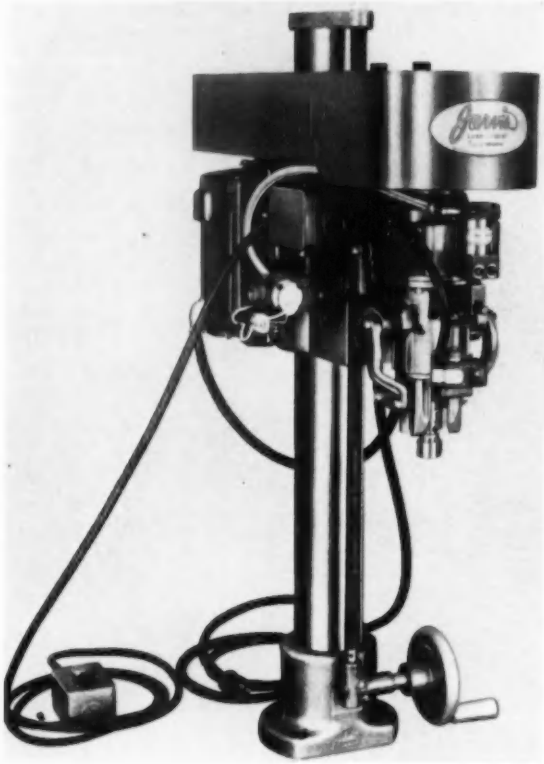
In Canada–
Air Reduction Canada Limited

All divisions or subsidiaries of Air Reduction Company, Inc.

Circle 193 on Inquiry Card, for more data

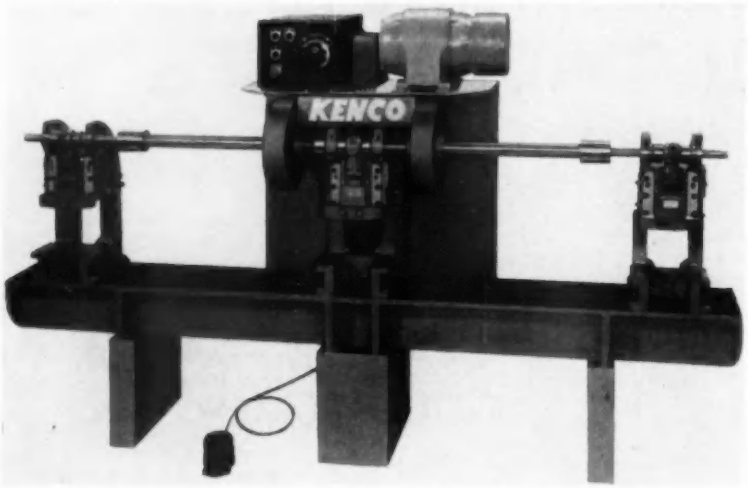
Continued from page 84

Adjustable Pitch Lead Screw Tappers



Pictured is an automatic, adjustable pitch lead screw tapper, adaptable to any drill press table. The unit is furnished in 5 standard models and has 4 speed pulleys, giving speeds of 575, 958, 1437 and 2415 rpm. The tapping cycle is completely automatic, through air and electrical controls, and can be inner - connected with the controls of an indexing table, if desired. Tap depth is electrically controlled and can be set to any depth within the stroke of the lead screw unit, which features rapid conversion from one pitch to another. (Jarvis Corp.)

Circle 47 on postcard for more data



Kenco Mark 111-5E press is designed for exceptionally long progressive die work

Punch Press Designed For Long Progressive Die Work

THE Kenco Mark 111-5E punch press is designed for exceptionally long progressive die work—also for punching, forming, and braking where extremely long die sets are used.

It consists of three 5-ton punch presses mounted on a rugged frame. Crankshaft and rams operate synchronously. The drive engages the crankshaft at a central point, eliminating differences in torsional twist. There are three bolster beds planed parallel to within ±0.002 in. for perfect alignment of the die set. Both frame and bed are sorbitic castings of the high rigidity necessary for precision punching. Presses are mounted on a ribbed-style casting which provides a firm, rigid base. *Kenco Mfg. Co.*

Circle 48 on postcard for more data

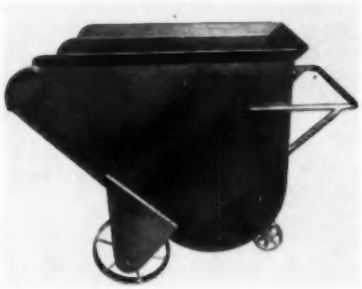
Double Lap Flarer

INTRODUCED by *Parker-Hannifin Corp.*, a pneumatically operated machine for forming a double flare on the end of ferrous and non-ferrous tubing handles tubing of ⅛ through ½ in. outside diameter with wall thicknesses of 0.028, 0.035, 0.042 and 0.049 in.

The machine is approximately four feet high and weighs 285 lb. Operating pressure is 70 to 120 psi.

Circle 49 on postcard for more data

Aluminum Chip Buggy



This aluminum chip buggy, weighing only 180 lb. s capable of handling loads of up to 1800 lb. Fabricated of 3/16 in. aluminum, the buggy is 44½ in. high, 30 in. wide and has a volume capacity of 32,000 cu-in. (E. W. Bliss Co., Rolling Mill Div.)

Circle 50 on postcard for more data

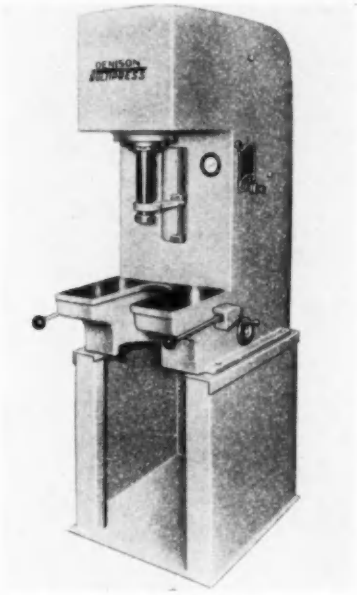
Coolant Servicer

THE Gorske coolant servicer blends coolant and meters it to machine tools all in one operation. The machine transports a variety of soluble oils and water directly to the tool and the operator selects the proper oil for the tool to be serviced and sets the ratio of oil to water on the metering dial. A counter, reading directly in gallons, is set for the amount of coolant to be delivered. The desired amount and blend of coolant is mixed and delivered to the machine tool in two to three minutes. *Gorske Industrial Equipment.*

Circle 51 on postcard for more data

Multipress Line

A line of Series "S" hydraulic multipresses, in capacities from 3 to 8



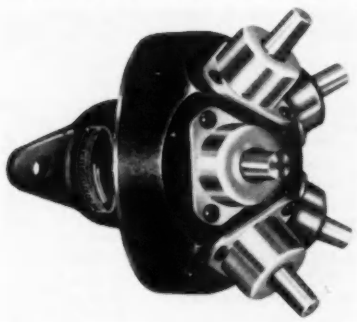
Denison Series "S" multipress

tons, has been announced by *Denison Engineering Div., American Brake Shoe Co.*

Principal features of these self-contained bench units are a large bed, rigid frame, more knee room, and an easily accessible adjustable relief valve to give adjustment of ram pressure. The units have a pushbutton gage valve for quick pressure reading and long gage life, a newly designed cylinder for fast operating speeds, and a quick-adjusting inch and stroke change control.

Circle 52 on postcard for more data

5-Position Turret Head



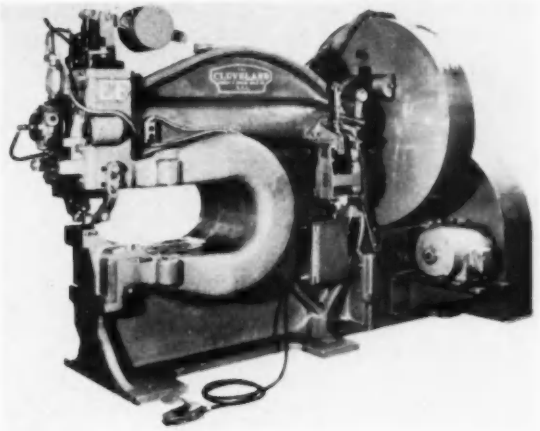
This 5-position turret head, named the Quindrill, makes possible five different operations on one drill press—drill, ream, tap, counterbore and countersink—without changing set-ups. (Chicago Quadrill Co.)

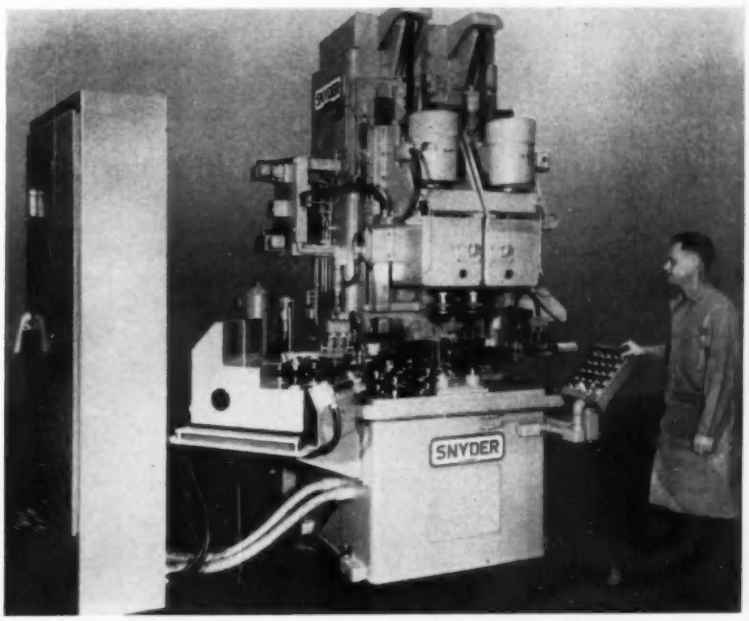
Circle 53 on postcard for more data

Vertical Open-Gap Unit With Solenoid-Operated Clutch

Featuring a solenoid-operated clutch and completely guarded gears and flywheel, the type EF vertical open-gap machine is designed for greater safety and precise operating control. The solenoid-operated clutch automatically stops the machine at the end of each operating cycle, eliminating the danger and scrap resulting from a machine that depends upon the operator to keep a cycle from repeating. (Cleveland Punch & Shear Works)

Circle 54 on postcard for more data





Snyder milling machine for balance-milling ends of forged connecting rods

Machine Balance-Mills Ends of Forged Connecting Rods

THIS Snyder special two-spindle milling machine hollow mills both crank and pin ends on each side of forged steel truck engine connecting rods to accurate balanced-weight conditions.

The machine, which produces parts at a rate of 102 pieces per hour, is an electrically-controlled, hydraulically operated type that uses a separate hydraulic unit to provide power for feeding the milling spindles and clamping the work piece securely.

A work holding fixture, a shadowgraph weigh scale and two vertical way-type milling slide units with single-spindle heads are supported by the welded steel machine base. The travel of each slide unit is individually and automatically adjusted by means of wedge stops operated by electrically-controlled hydraulic cylinders. *Snyder Corp.*

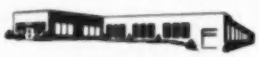
Circle 55 on postcard for more data

NEED TUBULAR RIVETS IN A HURRY ?

NEW ENGLAND DIVISION
Milford, Connecticut (Trinity 8-1761)

PENN DIVISION
Hatboro, Pennsylvania (Osborn 5-4560)

ILLINOIS DIVISION
Aurora, Illinois (Aurora 2-4278)



OHIO DIVISION
Elyria, Ohio (Fairfax 3-3177)

PACIFIC DIVISION
Norwalk, California
(Phone Whittier: Oxford 3-3777)

5 MILFORD MANUFACTURING PLANTS are within overnight trucking distance of your assembly line.

To give you unmatched service on tubular rivets, Milford has five manufacturing plants and twenty sales offices strategically located across the country's industrial beltline.

For the answers to delivery problems . . . *get in touch with Milford first!*

THE MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNA
ELYRIA, OHIO • AURORA, ILL. • NORWALK, CALIF.

Circle 194 on Inquiry Card, for more data

DESIGN SHOW

(*Continued from page* 82)

Fastening Devices

Dzus Fastener Co., Inc., will display fastener products having use in trucks, buses, aircraft engines, tractors, road-working and construction equipment and other diversified products.

Among these is the original standard line known for rapid, positive action. This line is made with body diameters from 3/16 to 7/16 in. and with flush, oval, oval wing, knob, ring, fillister and hex heads.

The Supersonic line is supplied in three basic sizes: 200, 500, and 700 lb, and with oval, oval wing, and flush heads. *Booth 505.*

Circle 290 on postcard for more data

High-Temperature Material

Grade HT-5000 laminated plastic, for use in aircraft, may be seen in the Taylor display.

The high-temperature material is made by alternating layers of two materials: one an asbestos mat impregnated with a special phenolic resin and the other a nylon fabric impregnated with this same phenolic. Grade HT-5000 can be supplied in sheets or tubes. *Taylor Fibre Co. Booth 1029.*

Circle 291 on postcard for more data

Instrument Plates

Stock precision ground instrument plates 3/16, ¼, ⅜, or ½ in. thick will be featured in the PIC display. They are available in stainless steel or aluminum and come in round, square and rectangular types in a wide selection of sizes.

The ground surfaces are flat and parallel to within ±0.0005. All six sides are ground to a 32 micro inch finish, and all corners are square to within ±5 minute tolerances. *PIC Design Corp. Booth 1259.*

Circle 292 on postcard for more data

Interlock File

The HP Interlock file, a completely modular approach to filing roll tracings safely and efficiently and the Assembler table, which provides large board, maximum storage and can be converted to a standard office desk in minutes without tools, will be on display in the Hamilton booth. *Hamilton Mfg. Co. Booths 507, 606.*

Circle 293 on postcard for more data

(*Turn to page* 152, *please*)

(Advertisement)

ADAMS FACT FILE #2

PLANT AIR

Moisture Chief Cause of Trouble . . .

Every company today is looking for ways to offset the increased costs of labor, material, equipment and services. At a gasoline station you expect "Free Air", but in industry it is a major expense. Perhaps in your own plant, for an investment in a few minor compressed air system alterations, significant savings are possible.

Water, sludge, rust, oil and dirt in compressed air systems are prime causes of maintenance and production down-time. Water vapor condensing in air lines tends to corrode the piping. Also, water present in the piping may freeze during winter, causing serious reduction of compressed air supply. Such restrictions are often difficult to locate and thaw. This same line moisture may emulsify lube oil destroying its lubricating value and the resultant mixture has high fouling characteristics. Frequently, ice will form within the tool itself since expanding air cools the moisture . . . tool efficiency will be seriously affected.

Some of the Other Problems Created By Wet Compressed Air . . .

Wet compressed air is not only a construction and production tool problem. Faulty paint jobs, contaminated chemical and food products can often be traced to moisture laden compressed air. Waterhammer, unequal pipeline thermal expansion and line leaks also result from collected moisture. In addition, air lost through traps, and in blow-down of compressed air lines provide no useful work . . . represent a sizeable power loss.

You Can Lick Compressed Air Moisture Problem . . .

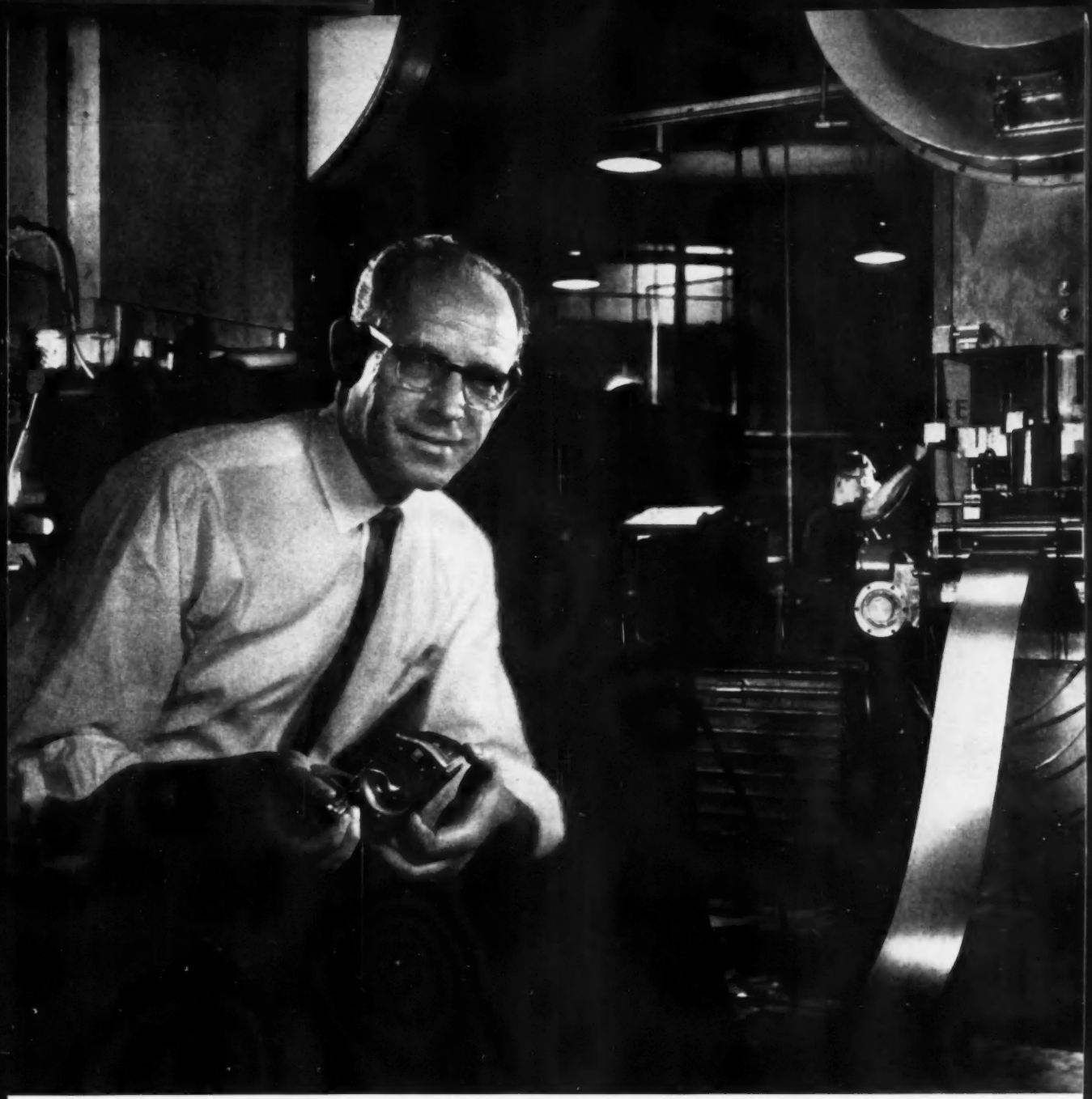
All of these hidden costs can be virtually eliminated by the installation of an Adams Aftercooler and Cyclone Separator between the compressor and receiver tank. By cooling discharge air to within 10° F. of cooling water temperature — guaranteed with Adams standard Aftercoolers — the moisture can be removed at the separator. Pressure loss is less than one-half pound on these units including the separator. In severe cases, moisture removal of over 90 per cent can be obtained by cooling the air with Adams 2° Aftercooler to within 2° F. of water temperature.

Air Filter for Final Protection at Point of Use . . .

As an added safeguard for expensive tools and equipment, an Adams Poro-Stone Air Filter should be installed just before the air is used. These filters remove all solid material picked up by the air stream. With an Adams Aftercooler, Cyclone Separator and Air Filters clean, dry, trouble-free air is supplied to your production tools. You get continuous service with minimum maintenance.

For further information on how the complete line of Adams air equipment can solve your compressed air problems, write today for your free copy of Bulletin No. 712 on Aftercoolers and Bulletin No. 117 on Poro-Stone Air Filters from the R. P. Adams Company, Inc., 264 East Park Drive, Buffalo 17, New York.

Circle 195 on Inquiry Card, for more data



"To keep Whirlpool first line requires first line steels" —LESTER FIRST—DIRECTOR OF QUALITY CONTROL

"Quality control is important to Whirlpool, and to maintain the highest standards we must begin with quality materials," says Lester First, Director of Quality Control at Whirlpool's Clyde, Ohio plant.

"Through constant checking I find that Sharon is one of our suppliers we can rely on for consistently good steel right to our specs," Mr. First continues.

Leading appliance makers, like Whirlpool, know there's no substitute for quality steel. For quality steel there's nothing finer than that produced in the mills of the *Sharon Steel Corporation, Sharon, Pa.*

SHARONSTEEL **SHARON** *Quality* **STEEL**

Circle 196 on Inquiry Card, for more data

the **STRIPPIT**
FABRICATOR

WORK PIECE – Electronic Chassis — 10" x 14" — 23 holes — 5 sizes — 4 different shapes — 4 corner notches

SETUP TIME – 9.3 minutes

PRODUCTION RUN – 5 pieces

PRODUCTION TIME PER PIECE – 2.8 minutes

For short or pilot runs—model shop and experimental work—no other single machine can match the production capabilities and profit potential of the Strippit Fabricator.

PUNCHES—any round or shaped hole up to 3½" diameter in sheet material — up to ¼" mild steel.

NOTCHES—90° corners — rectangular, radii, vee and special shape edge notches — up to ⅛" capacity in mild steel.

NIBBLES—straight line or contour shearing up to a 38" diameter circle, at 165 strokes per minute, ⅛" mild steel.

ACCURATE, QUICK-SET GAUGING—a unique, multiple-stop system permits exact positioning of the work to any layout specifications in seconds instead of minutes.

QUICK-CHANGE PUNCHES AND DIES—changed from one size to another in less than 20 seconds — within easy reach in labeled, built-in file drawers.

EASY CONVERSION—to a production punching unit by adding the Strippit Duplicator for high speed production of hundreds of pieces — and the Dupl-O-Scope to punch Duplicator templates from a drawing, layout or sample part.

WRITE TODAY—for Catalog 10 AA and an actual demonstration right at your own plant of the capabilities of this high-profit fabrication system, by a Strippit Mobile Demonstration Unit.

WALES STRIPPIT INC.
242 Buell Road • Akron, New York
In Canada: Strippit Tool & Machine Company, Brampton, Ontario

A DIVISION OF HOUDAILLE INDUSTRIES INC.

DESIGN SHOW

(Continued from page 150)

Port Sealing Method

"Dura-Tite," a method of part sealing on tube couplings, will be the feature of Imperial's exhibit. The method consists of a lock nut with a tubular portion at its base. A split nylon of Teflon ring is inserted into the void between the tubular section and the fitting groove. The edge is then crimped to retain the resilient sealing medium, which is confined and not subject to extrusion or creep.

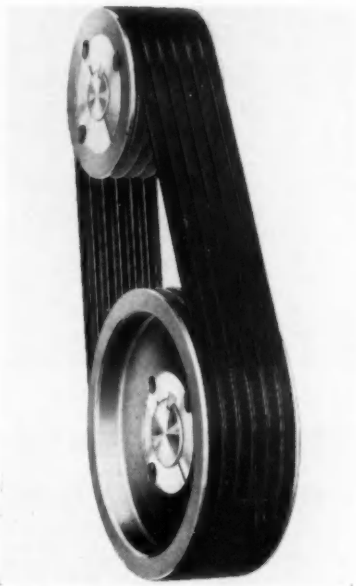
Other products to be shown by Imperial include tube fittings and 37 degree flared tube fittings in steel, stainless steel and brass. *The Imperial Brass Mfg. Co. Booth 1538.*

Circle 294 on postcard for more data

V-Belt Drives

A wide variety of power transmission components will be exhibited by *Dodge Mfg. Co.* The exhibit will include a motorized line of bearings to show the full line of mounted antifriction and sleeve bearings. An operating display of Dodge Dyna-V drives will be included.

Other products to be shown will include Taper-Lock roller chain drives



and shaft couplings, Para-flex flexible cushion couplings, Flexidyne dry fluid drives and couplings and Torque-arm shaft mounted speed reducers. *Booth 1105.*

Circle 295 on postcard for more data

(Turn to page 154, please)

Circle 197 on Inquiry Card, for more data

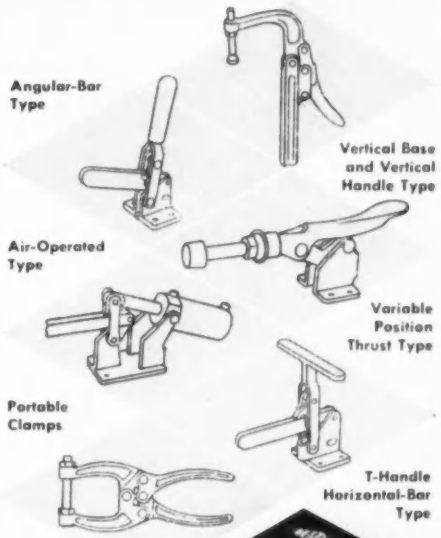
Circle 198 on Inquiry Card, for more data ——→

Where It's Quality, Quality, Quality!
It's Quality DE-STA-CO Toggle Clamps

FINAL INSPECTION OF ROSS OPERATING VALVES subjects every valve to a pressure test far exceeding its normal usage. For over fifteen years, fixtures similar to this, all employing De-Sta-Co No. 620 plunger clamps, have been built to do this critical high pressure sealing job.

Whether your holding and clamping operation is inspection, machining, tapping, grinding, welding, bonding or other assembly, there is a specific De-Sta-Co Toggle Clamp to do it better. Fast action, positive clamping, long life through thousands of production operations have made De-Sta-Co known for almost 30 years as the leading tool in the field. And all of our medium and larger models use hardened serrated pins in hardened bushings staked to prevent wear. A broad selection of spindle accessories increases the versatility of the clamp you specify.

Our representative in your area is qualified and ready to serve you. Send for our catalog showing clamp applications, scale drawings and complete information.



DE-STA-CO

ORIGINATORS OF PRODUCTION CLAMPING

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DETROIT STAMPING COMPANY

297 MIDLAND AVENUE · DETROIT 3, MICHIGAN

DESIGN SHOW

(*Continued from page* 152)

Versatile Bearings

Dixon will exhibit various bearing products. Among these will be T-Liner bearings, constructed of a reinforced Teflon tape inserted in a steel holder. It is used for loads and speeds up to 10,000 pv. Another bearing to be displayed is the S-Liner. This bearing is made using a fine wire mesh spray coated with "Rulon" material firmly bonded to a steel backing. It carries loads up to 20,000 pv. F-Liner bearings consist of "Ruslon" Teflon cloth bonded to a steel backing and are for loads up to 20,000 psi and 40 fpm. *Dixon Corp. Booth 1159.*

Circle 296 on postcard for more data

Fastening Products

An automated assembly unit for production installation of Heli-Coil inserts will be demonstrated in Heli-Coil's booth.

A high-speed inserting tool, hopper feed unit and special power tools for the installation of Heli-Coil inserts will also be shown. The miniature 4-40 Screw-Lock insert, which is said to eliminate the need for lock washers, lock wires or lock nuts, as well as the complete line of larger screw-lock inserts will be shown, along with kits of inserts, taps and tools for thread repairs in machine tools. *Heli-Coil Corp. Booth 324.*

Circle 297 on postcard for more data

Ceramic Wear Plate

Coors Porcelain Co. will show a wear plate that has withstood approximately five months severe abrasion without any noticeable change of surface. It is used on a centerless grinder and is said to be typical of some of the applications for the high alumina ceramic.

High alumina ceramic plungers will also be shown. These products are finding applications in reciprocating pumps. Hydrofluoric acid is one of the few solutions which reacts at all with the ceramic from which these plungers are made. *Booth 603.*

Circle 298 on postcard for more data

• • •

NMBTA Head Warns of Danger From Foreign Tool Builders

Competition from foreign machine tool builders poses a serious threat to U. S. manufacturing, warns Ralph J. Kraut, president of Giddings & Lewis Machine Tool Co. and the National Machine Tool Builders' Association.

Kraut says the U. S. will lose its position as the leading manufacturing nation unless the wage-price inflation is checked in this country. Wage rates abroad, he says, are one-fourth to one-fifth of American rates. Meanwhile, foreign technology has caught up with ours.

Speaking at the NMBTA spring meeting in Detroit, Kraut warned that the American economy generally "is pricing itself out of the market." He said both England and West Germany outproduced the U. S. in machine tools in 1958. Russia, he added, is turning out 120,000 machine tools a year and is aiming at 200,000, compared with the U. S. figure of less than 30,000 in 1958.

Kraut recommends a four-point program to ease the situation: reduced taxes at all levels to release more capital; balanced budgets and strict economy in government; management-labor efforts to boost productivity and hold down costs; and finally, protective tariffs, quotas and embargoes.

Information for Authors of Technical Articles for AUTOMOTIVE INDUSTRIES

Authors of technical papers proposed for Automotive Industries Magazine are invited to write to the editors for comments and suggestions before sending in final drafts of the articles. The following procedure will save time and effort for both the authors and AI Editors, if followed by prospective contributors:

1. Clearly define the subject of the proposed article. Avoid vague descriptive terms.

2. Briefly summarize the Author's special qualifications for writing the article.

3. Prepare a 150 word summary or outline of the proposed text, telling the following details:

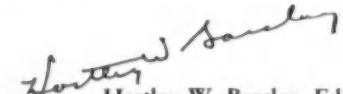
   a. What industrial production, design, tooling or engineering problem will be discussed.

   b. What benefits in reduced costs, increased output, reduction in idle machine time, improved tooling, or use of materials resulted.

   c. What sketches, illustrations or drawings are available.

   d. What data or tabulated figures are available?

If you do not have a current topic or subject for an article at this time, but would like to be considered as a prospective author of a future article, write for the AI — "Letter to Contributors" for guidance on your article-writing plans.



Hartley W. Barclay, Editor
AUTOMOTIVE INDUSTRIES
Chestnut and 56th Streets
Philadelphia 39, Pa.

More horsepower for the new Caterpillar D8 tractor

AIRESEARCH
T-1404
TURBOCHARGER

Turbocharger system specifically designed for big Series H tractor

A joint development of Caterpillar and AiResearch, the turbocharger system is an integrated part of the new D8 Series H tractor. Extensive field tests showed an increase of 20% in bulldozing and a substantial gain in pushloading production with the Series H... brought about by the tractor's greater horsepower, faster torque rise, greater weight and faster dozing and reverse speeds.

Specifically designed to match the new tractor's requirements, the new turbocharger underwent thousands of test hours on the new D8 operating in every kind of material on every kind of job.

AiResearch turbocharger advantages include: increased horsepower, improved lugging ability, cooler exhaust temperatures, reduced maintenance costs, less smoking and noise. This is another application of AiResearch turbochargers to heavy industrial machinery.

THE GARRETT CORPORATION

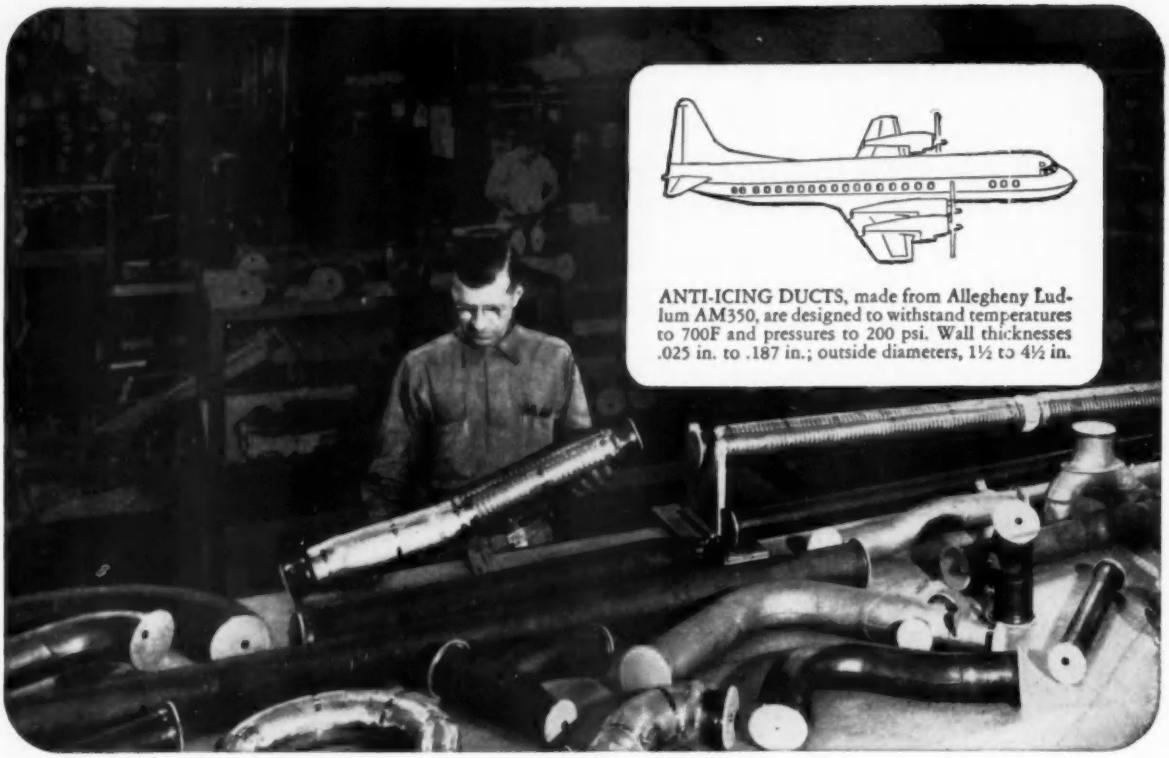
AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

Circle 199 on Inquiry Card, for more data

Experience**—the extra alloy in **Allegheny Stainless



ANTI-ICING DUCTS, made from Allegheny Ludlum AM350, are designed to withstand temperatures to 700F and pressures to 200 psi. Wall thicknesses .025 in. to .187 in.; outside diameters, 1½ to 4½ in.

made from Allegheny Ludlum precipitation-hardening stainless:

Prop-jet's anti-icing ducts take high heat and pressure in stride

The anti-icing system of a new prop-jet airliner was designed to operate under high heat and pressure, yet the ducting had to be as light as possible. AM350 was specified. Both AM350 and AM355, Allegheny Ludlum's precipitation-hardening stainless steels, have strength/weight ratios at 600F five times greater than the usual aluminum aircraft alloy. In fact, AM350 and AM355 maintain high strength from room temperature up to 1000F.

These space age metals have other properties highly desirable: excellent corrosion resistance, ease of fabrication, low temperature heat treatment, good resistance to stress corrosion.

These features have been used to advantage in airframe structural members, airframe skins, pressure tanks, power plant components, high pressure ducting, nacelles and other missile and supersonic aircraft applications.

availability: AM350, introduced several years ago, is available commercially in sheet, strip, foil, small bars and wire. AM355, best suited for heavier sections, is available commercially in forgings, forging billets, plates, bars and wire.

corrosion resistance: Compared to the more familiar stainless grades, AM350 and AM355 resist corrosion and oxidation better than the hardenable grades (chromium martensitic) and only slightly less than the 18 and 8's. They resist stress corrosion at much higher strength levels than do martensitic stainless grades.

simple heat treatment: High strength is developed by two methods. Both minimize oxidation and distortion problems. The usual is the Allegheny Ludlum-developed sub-zero cooling and tempering (SCT): minus 100F for 3 hrs plus 3 hrs at 850F. Alternate method is Double Aged (DA): 2 hrs at 1375F plus 2 hrs at 850F.

easy fabrication: AM350 and AM355 can be spun, drawn, formed, machined and welded using normal stainless procedures. In the hardened conditions, some forming may be done . . . 180 degree bend over a 3T radius pin. Also AM350 can be dimpled in the SCT condition to insure accurate fit-up.

For further information, see your A-L sales engineer or write for the booklet "Engineering Properties, AM350 and AM355." ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*** Address Dept. AI-17.

WBW 7341

ALLEGHENY LUDLUM

EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT

as LIGHT as aluminum —WEARS like iron

Unretouched photo of VANASIL piston

MICRO-X VANASIL pistons have run way over 200,000 miles with only *.002"* to *.005"* wear on the top ring grooves. How much wear develops in top ring grooves on the pistons you are using—in 100,000 miles? In 200,000 miles, if they are ever run that far?

On-the-road ring breakdown caused by badly worn grooves are almost eliminated because *Vanasil Pistons reduce top ring groove wear up to 75%!* Nothing else compares with the genuine G & E Vanasil—the original hyper-eutectic silicon alloy, proved by 19 years of use.

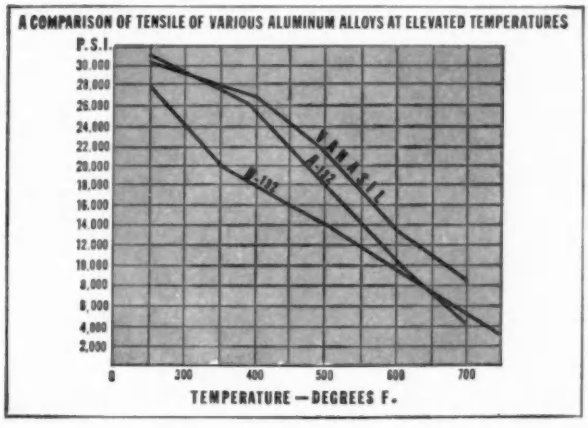
You Get ALL these Advantages only in

VANASIL PISTONS

G & E's proved Hyper-eutectic Silicon Aluminum Alloy

1. **LIGHT WEIGHT**—Same as other aluminum alloys.
2. **SCORING, SCUFFING MINIMIZED**—Because of "Oil-absorbing" microscopic porous texture.
3. **LONGER LIFE** — 30% less friction — 30% harder. Greater "hot" strength—see chart below.
4. **TOP RING**—Breakage virtually eliminated because of reduced ring groove wear.
5. **LOW EXPANSION**—Characteristics of Cast Iron.
6. **CLOSE CLEARANCES**—Fitted with Cast Iron Clearances.
7. **SOLID SKIRT DESIGN**—No expansion devices required.
8. **HIGH HEAT CONDUCTIVITY**—Similar to other aluminum alloys.
9. **GRAIN GROWTH**—None.
10. **PLATING**—No tin or other break-in coating required.

VANASIL Piston Warehouse Stocks:



MICRO-X VANASIL PISTONS for Gasoline and Diesel Engines

*Gillett & Eaton's trademark for a hyper-eutectic silicon aluminum alloy

GILLETT & EATON, INC. • Est. 1868
841 DOUGHTY ST., LAKE CITY MINNESOTA

SEND COUPON

GILLETT & EATON, INC.
841 Doughty St., Lake City, Minn.

Please send circular and prices on Vanasil Pistons in over 60 types and sizes for gasoline and diesel engines.

Name.....

Firm Name.....

Address.....

Circle 201 on Inquiry Card, for more data

Quantity
PRODUCTION
of
GREY IRON CASTINGS

*

ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES

*

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

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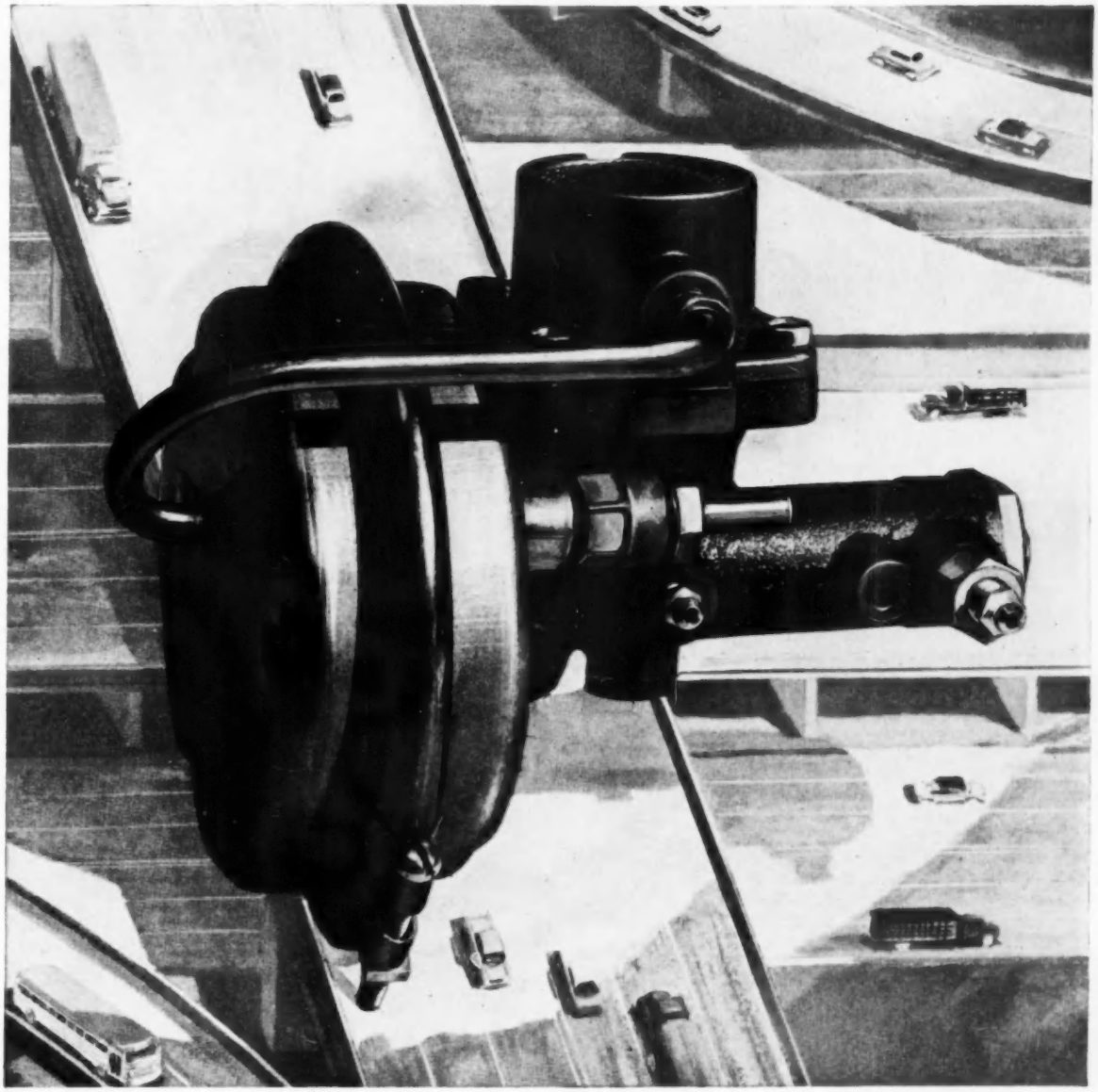


MIDLAND

MIDLAND POWER BRAKE – Safety for a Nation on Wheels

Midland products include:

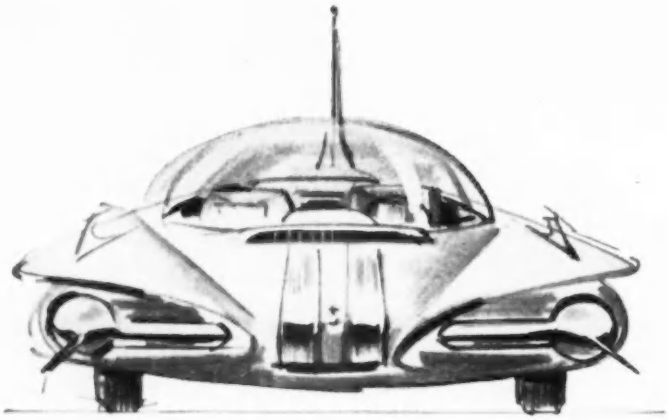
Air brakes for the truck and trailer industry
Vacuum power brakes for the automotive industry
Equipment for the Transit industry
Control devices for the construction industry
Midland Welding Nuts for assembling metal parts

Write for detailed information

MIDLAND-ROSS CORPORATION

Owosso Division • Owosso, Michigan

ONE OF THE "400" LARGEST AMERICAN CORPORATIONS



PUROLATOR'S DRY TYPE AIR FILTERS GIVE

COMPLETE DESIGN FREEDOM

With Purolator's new dry type air filters, there's no need to keep a constant, level bearing . . . to set the air cleaner on top of the block. There is no oil to spill, no level to be maintained. This makes it possible to place the filter anywhere at all . . . under the engine, on the side . . . wherever it allows the most design freedom.

Of course, the big advantage in dry type filtration is the optimum efficiency it affords. The Micronic dry type element is just as effective at low speeds as at high speeds. And instead of becoming less efficient with use, its already outstanding 99% efficiency *increases* to 99.7%.

Design your cars the way you want them . . . then call on Purolator to design and produce the air filter to fit your design.

Filtration For Every Known Fluid **PUROLATOR**

PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

Circle 204 on Inquiry Card, for more data

see McQUAY-NORRIS
for better rings
Quality is no accident. It comes only through rigid production standards and continuous quality control, through "light-tight" tests and other checks that have set the finest standards you'll find anywhere in the industry! Let us put these standards of quality to work for you.
McQUAY-NORRIS MANUFACTURING CO. • ST. LOUIS • TORONTO
Largest producer of small rings in the automotive industry.

(Advertisement)

Engineers:
Here are sound reasons why it pays to specify
USS Shelby Seamless Mechanical Tubing

USS Shelby Seamless Steel Mechanical Tubing offers you extraordinary freedom of design in a wide range of products from bushings to hydraulically operated telescoping booms. And, Shelby Seamless Tubing helps cut processing costs, because it eliminates drilling operations; enables you to replace drills with simple, less expensive boring tools, and it reduces tool wear and tool changes; and, more important, more uniform parts can be turned out by the hundreds or thousands.

Where Shelby Seamless Tubing is used as a load-carrying member or part, it exhibits a number of structural advantages over other forms. *Here are a few:* it gives you a superior cross section when a part is designed to withstand equal loading in any direction; it resists bending stresses equally in all directions; it is able to absorb and localize shock; and in torsion, it provides better material distribution, and for a given weight, can withstand more load than other sections.

And, of course, the name Shelby is backed by the world's largest and most experienced manufacturer of seamless tubing—National Tube! The production of Shelby Seamless Tubing, from ore to finished product, is entirely controlled by one organization. There is no divided responsibility. Every foot, every length, is made under the careful supervision of skilled men with years of tubemaking experience. For more than 60 years, Shelby Seamless Tubing has been first with men who want the best in mechanical tubing.

You'll find Shelby Seamless Tubing available at select Shelby Distributors throughout the country. These distributors are strategically located and expertly trained in solving all types of tubing problems. Here, you can choose from a complete range of sizes and stocks. If you'd like to find out how Shelby Seamless Tubing can be most effectively applied to your designs, contact your nearest Shelby Distributor . . . *soon!*

USS and Shelby are registered trademarks

National Tube
Division of
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Supply Division - United States Steel Export Company, New York

NADELLA

The NEEDLE THRUST BEARING WITH INTEGRAL RACEWAY

- NO THICKER THAN A WASHER
- LARGE LOAD CAPACITY
- CUTS COSTS
- RUGGED CONSTRUCTION

ALSO...
SPECIAL DESIGN
FOR HIGH-PRECISION APPLICATIONS

(. 1102 inch)
2,8

Metric sizes - D_i and D_e shown in mm and inches

AX	15 28	17 30	20 35	25 42	30 47	35 53	40 60
D_i	15 / .5906	17 / .6693	20 / .7874	25 / .9843	30 / 1.1811	35 / 1.3780	40 / 1.5748
D_e	28 / 1.1024	30 / 1.1811	35 / 1.3780	42 / 1.6535	47 / 1.8504	53 / 2.0866	60 / 2.3622

OTHER SIZES UNDER DEVELOPMENT

NADELLA ALSO MAKE

- Needle rollers
- Needle bushes
- Needle roller bearings
- Cam followers

133 à 137, BOULEVARD NATIONAL, **RUEIL-MALMAISON** (S.-&-O.) - TÉL. : 967 - 1015 (+)

ACTA 6811 FR

Circle 206 on Inquiry Card, for more data

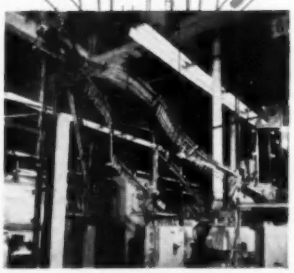
THE DIVISIONS OF THOMPSON RAMO WOOLDRIDGE INC.... *Sixth in a series*

More than fifty years and a billion valves later

TRW's AUTOMOTIVE GROUP *has a growing stake in America's transportation future*

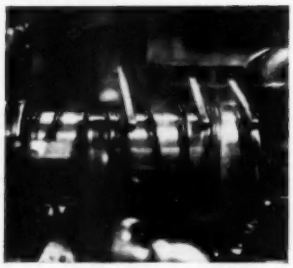
America on wheels means an America driving cars and trucks equipped with precision-manufactured parts produced by the five divisions comprising the Automotive Group of Thompson Ramo Wooldridge Inc. TRW's diversified and expanding future in cars and trucks is based on its fifty-year leadership in the industry, and on the many millions it has invested in new plants, new equipment and new methods of automated mass production. The Automotive Group sells $100 million worth of automotive parts every year. Here are some typical examples: the more than a billion valves produced by the *Valve Division* are to be found in the majority of cars on the road today; the greased-for-life steering linkages produced by the *Michigan Division*... piston rings by *Ramsey*... high quality castings by the *Light Metals Division*... and world-wide distribution by the *Replacement Division*... all attest to the Automotive Group's deep product penetration. Moreover, TRW's scientists and engineers are engaged in broad supporting R & D programs for new developments for the years ahead. Whatever kind of car the future calls for—big car, small car, gas turbine—TRW is equipped in plant, knowledge, and experience to play an important role in producing it.

View of Valve Division's 100,000 square foot automotive valve packing and shipping department



Automatic valve finishing line

Piston ring production on the Norton automatic line



Thompson Ramo Wooldridge Inc.

MAIN OFFICES
CLEVELAND 17, OHIO
LOS ANGELES 45, CALIFORNIA

Circle 207 on Inquiry Card, for more data

Aetna cylindrical ROLLER BEARINGS are

VERSATILE

...in assembly
...in application

Made in the two basic load carrying types of pure radial and pure thrust, they are supplied with the construction *exactly suited* to your requirements with standard, precision or super-precision tolerances in special alloys to give longer life to your products:

as complete self-contained bearings
with separable inner and outer races
with a full complement of rollers
with retainers of various types and materials

True Crowned Rollers

Each AETNA Roller Bearing incorporates rollers which are expertly ground to a fine finish with a large radius to relieve the high stress points present where two cylindrical bodies are in rolling contact and under load. The crown radius is scientifically determined and varies with the size of the roller. The result is a roller bearing which provides 10% to 15% longer service life by actual service records, because true crowning provides the best distribution of load stresses across the full length of the roller.

Call your local AETNA representative listed in the yellow pages of your Classified Telephone Book for application information, or write for General Catalog and Engineering Manual—new 15th Edition.

Aetna

AETNA BALL AND ROLLER BEARING COMPANY

DIVISION OF PARKERSBURG-AETNA CORPORATION • 4600 SCHUBERT AVE. • CHICAGO 39, ILL.

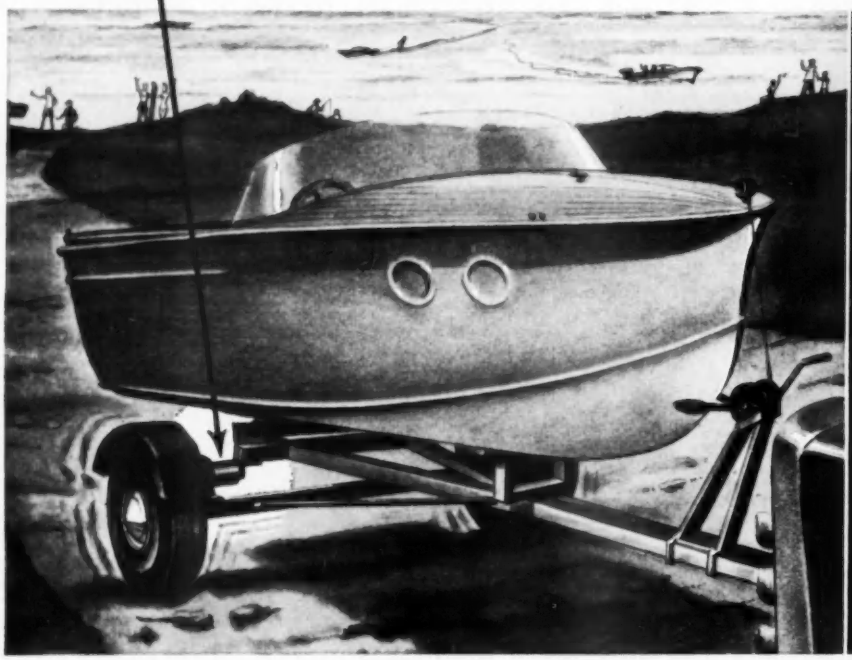
ANTI-FRICTION SUPPLIERS TO LEADING ORIGINAL EQUIPMENT MANUFACTURERS SINCE 1916

IN DETROIT—SAM T. KELLER, 1212 FISHER BUILDING

Circle 208 on Inquiry Card, for more data

elastomeric springs:

new, low-cost suspension for trailers and light vehicles



Designers can gain cost and performance advantages by using Lord elastomeric springs on:

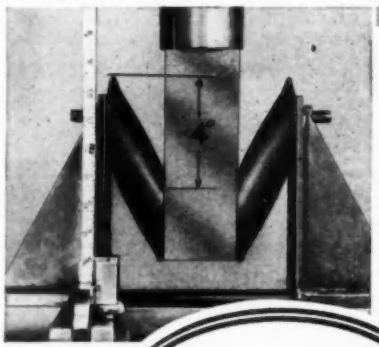
- boat trailers
- motorized scooters
- utility trailers
- baggage trailers
- ground handling equipment

Take the strength of steel and the long-wearing resilience of rubber. Bond them together permanently in a simplified assembly. The result: an elastomeric spring, today's most promising approach to suspension problems.

LORD elastomeric springs have superior characteristics which introduce vital savings in overall suspension. Shock absorbers are unnecessary due to inherent damping. Good stability characteristics eliminate lateral guide bars. Ease of attachment permits simpler supporting brackets, cuts assembly time and cost. Excellent service life is provided with no maintenance or lubrication required.

A safe, smooth ride is assured by high shock absorbing capacity and multi-directional cushioning. Light and compact, elastomeric springs also provide space savings, lower unsprung weight and a cleaner, more modern appearance.

LORD-designed elastomeric springs are used for thru-axle, individual wheel and dual-axle suspensions over a wide load range. Designers can obtain complete information from the nearest Lord Field Engineer or the Home Office, Erie, Pa.



High strength of elastomeric springs is demonstrated in load-deflection test. They provide greatest energy absorption for given weight and size.

LORD
BONDED RUBBER

FIELD ENGINEERING OFFICES

ATLANTA, GEORGIA - CEdar 7-9247
BOSTON, MASS. - HAncock 6-9135
CHICAGO, ILL. - MIchigan 2-6010
DALLAS, TEXAS - RIverside 1-3392
DAYTON, OHIO - BAldwin 4-0351
DETROIT, MICH. - DIamond 1-4340
KANSAS CITY, MO. - WEstport 1-0138
LOS ANGELES, CAL. - HOllywood 4-7593
NEW YORK, N. Y. - Circle 7-3326
PHILADELPHIA, PA. - PEnnypacker 5-3559
SAN FRANCISCO, CAL. - EXbrook 7-6280

"In Canada—Railway & Power Engineering Corporation Limited"

LORD MANUFACTURING COMPANY • ERIE, PA.

Circle 209 on Inquiry Card, for more data

protection is stainless steel

Summer or winter the car with plenty of Stainless Steel
is easy to clean and keeps its good looks
under the roughest conditions of driving and weather.

No other metal offers the freedom of design and fabrication,
economy of care and the durable beauty that serves
and sells like Stainless Steel.

McLOUTH STEEL CORPORATION, Detroit 17, Michigan

specify

McLOUTH STAINLESS STEEL

HIGH QUALITY SHEET AND STRIP

for automobiles

Circle 210 on Inquiry Card, for more data

interchangeable with all standard JIC cylinders

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1 One Piece Piston

2 Hard Chrome Cylinder Bore and Piston Rods

3 High Tensile Steel Tie-Rods

4 Cushion Adjusting Screw, Externally Adjustable

5 New Super-Cushion for air, or Self-Aligning Master Seal for Oil (T-J Patents)

6 Solid Steel Heads and Mounting Plates Standard all Models

7 Port Design Allows Minimum Pressure Drop on Inlet or Outlet

8 Chevron Type, Self-Adjusting Rod Packing

9 Piloted Packing Gland—Absolute Alignment

10 Piston Rod, Extra Strong—Polished and Chrome Plated for Efficiency and Protection

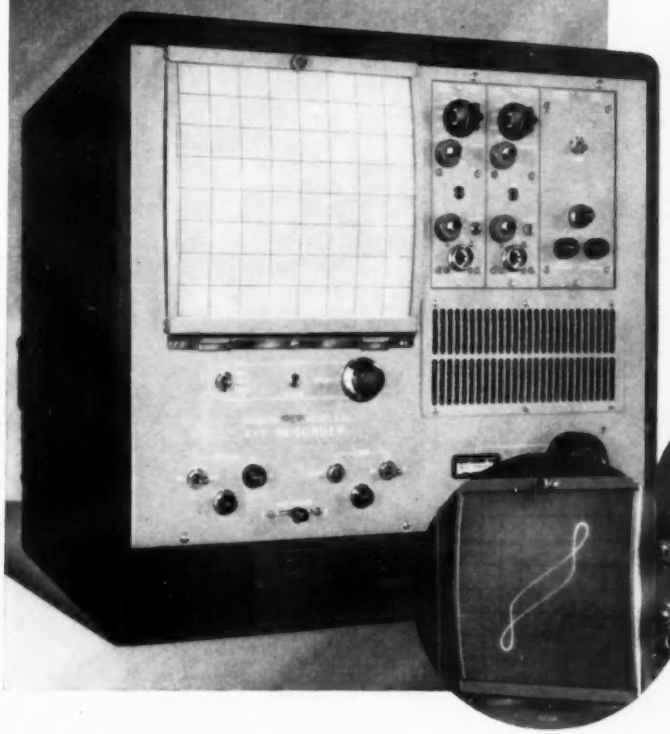
With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures . . . and is also adaptable to the use of low pressure oil as the working medium. Write to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

T-J TOMKINS-JOHNSON

Circle 211 on Inquiry Card, for more data

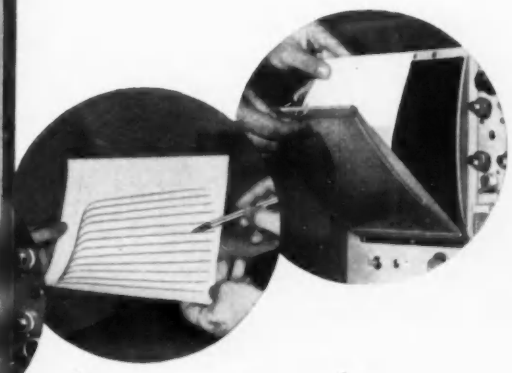
100 CPS X-Y RECORDING

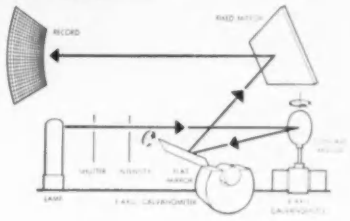
with immediate readout



THE NEW SANBORN MODEL 670 OPTICAL X-Y RECORDER HAS

- 1% linearity
- frequency response 3 db down at 130 cps independent of amplitude
- writing speeds to 2500 in/sec.
- 8" x 8" direct print paper chart
- trace monitoring on phosphorescent screen





X-Y RECORDING never before possible with electromechanical instruments can now be done with the new Sanborn Model 670 X-Y Recorder. Direct writing on ultraviolet-sensitive recording paper by a beam deflected by optical galvanometers makes possible the combination of fast writing speed and 130 cps frequency response not found in any other X-Y recorder. Transistor characteristics, acceleration and vibration of mechanical parts and events of similar short duration can be recorded with linearity of *1% of full-scale* and at trace speeds as fast as *2500 inches per second*. Square wave response exhibits no greater than ½% overshoot *at any amplitude;* sensitivities as high as 62.5 uv/inch (depending on preamplifier used).

PLOTS OCCUPY AN 8" x 8" RECORDING AREA and can be previewed or monitored on the instrument's phosphorescent screen. An Axis Record switch to print X and Y axes on the record, and a Beam Intensity Control to assure maximum trace clarity, are among the front panel controls provided. An 8" x 8" sheet of the ultraviolet-sensitive chart paper (stored in drawer at base of cabinet) is easily placed on the back of the hinged screen. Brief post exposure in normal room light is the only developing process.

OPTIONAL INTERCHANGEABLE PREAMPLIFIERS for each axis presently include the Model 850-1300B DC Coupling and Model 850-1200 Phase Sensitive Demodulator; a Carrier Preamplifier, High Gain Preamplifier and a time base generator are now in development. Driver Amplifiers are compact, fully transistorized plug-in units with single-ended input and output. Galvanometers are low resistance, low voltage units of rugged, enclosed construction; sensitivity and damping are independent of coil temperature. Accessible, unitized circuitry also extends to the power supplies—a front-panel plug-in for both preamplifiers and a second supply for both driver amplifiers. A built-in blower provides constant, forced filtered air cooling. The Recorder can be rack mounted in 15¾" of panel space, or housed in its own 20" x 20" x 21¼" optional portable cabinet.

Ask your local Sanborn Sales-Engineering Representative for complete information on the Model 670 X-Y Recorder, or write the Industrial Division in Waltham, Mass.

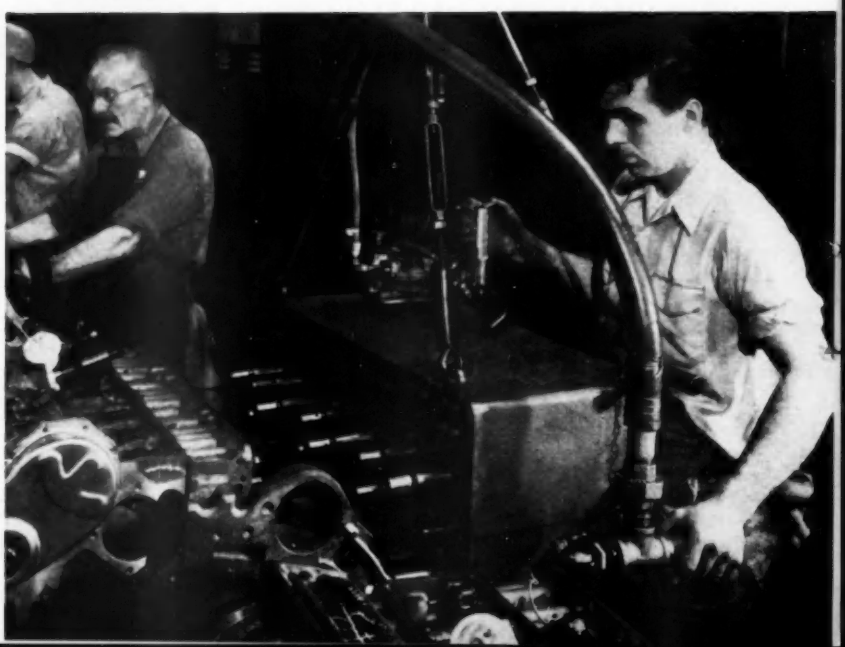
SANBORN COMPANY

INDUSTRIAL DIVISION

175 WYMAN STREET, WALTHAM 54, MASS.

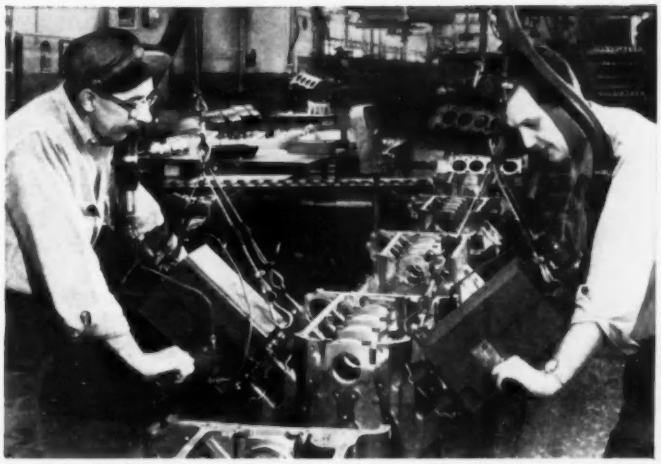
YOU CAN

4-spindle Magnamatic Multi-runner.

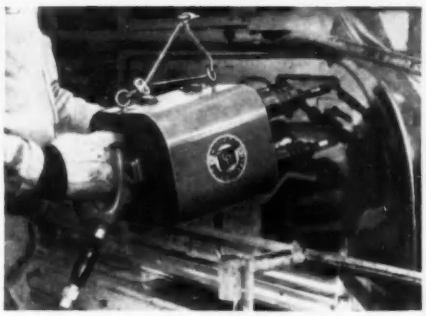


CP Multi-runner makes installing 18 cylinder head bolts a one-shot operation.

18-spindle Multi-runner drives 5/16" bolts on transmission oil pan assembly.



4-spindle Multi-runners make fast work of installing front motor mounts.



4-spindle Magnamatic Multi-runner sets cap screws on window regulator to uniform tightness, then releases instantly.

PUT "EXTRA QUALITY" INTO YOUR PRODUCT when you use CP MAGNAMATIC Multi-runners

Put CP Magnamatic Multi-runners in the hands of your assembly operators and every fastener—on every unit—will be run to the proper torque. You don't have to do "follow-up" tightening by hand. You can spot check instead of checking every unit. You can hold your quality while you cut your time.

Even inexperienced operators drive nuts, bolts and studs to exactly the prescribed torque, because every Magnamatic spindle has a patented clutch that disengages when proper torque is reached. Despite variations in air pressure and motor wear, these clutch settings seldom require readjustment.

You can get Magnamatic Multi-runner units in five basic sizes, each adjustable within a wide range, handling torques from ½ to 350 foot pounds.

Chicago Pneumatic

Pneumatic Tools • Air Compressors • Electric Tools • Diesel Engines
Rock Drills • Hydraulic Tools • Vacuum Pumps • Aviation Accessories

Chicago Pneumatic Tool Company, Dept. M-5
8 East 44th Street, New York 17, N. Y.

☐ Please send me FREE Bulletin 580.

☐ Have representative call.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Circle 213 on Inquiry Card, for more data

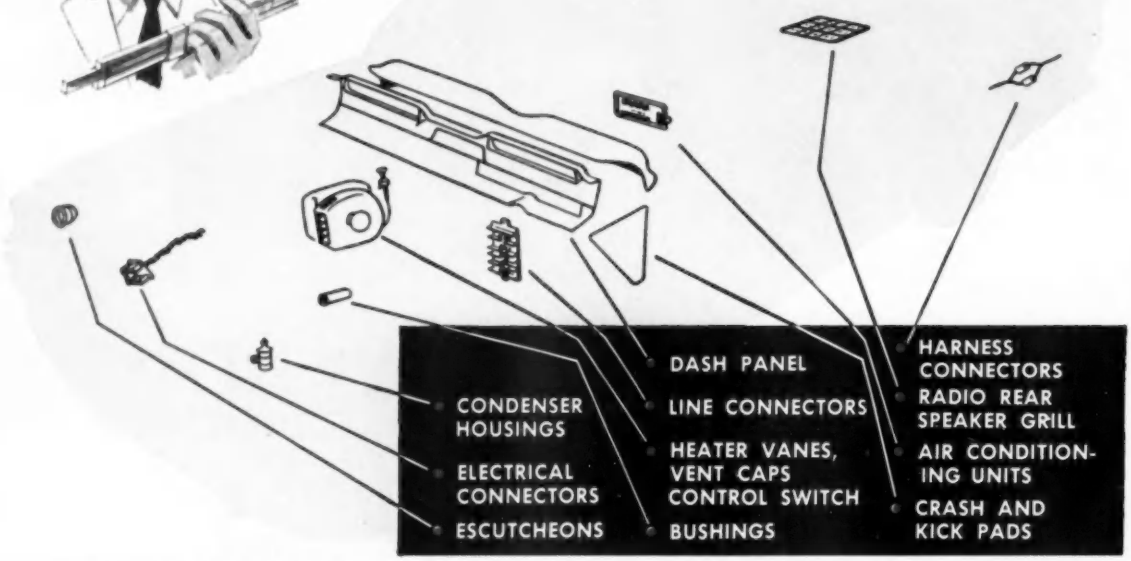
CYCOLAC®

THE TOUGH, HARD **ABS** PLASTIC

from **BORG-WARNER**

SERVES THE AUTOMOTIVE INDUSTRY

with economical, long-lasting parts and assemblies!



BETTER IN *MORE* WAYS THAN ANY OTHER PLASTIC!

Only Cycolac combines so many advantages in one versatile material! It's rigid—it's tough—it gives you high impact resistance, even at temperature extremes. Cycolac meets your demands for rugged duty *without* requiring increased sections. It brings you every design and economic advantage of plastic molding and vacuum forming. Get extra quality and extra performance per dollar with Cycolac.

the New dimension in design . . .
the New element in production!

only CYCOLAC *has all these advantages!*

- Superior Impact Strength at Low Temperatures
- Rigidity — at High Temperatures
- Easily metallized
- Corrosion, Stain Resistant
- Tough, Hard Surface
- Wide Range of Colors
- Can Be Painted
- Good Electrical Properties
- Dimensional Stability

WRITE FOR COMPLETE INFORMATION TODAY!

PACESETTER IN

Marbon CHEMICAL

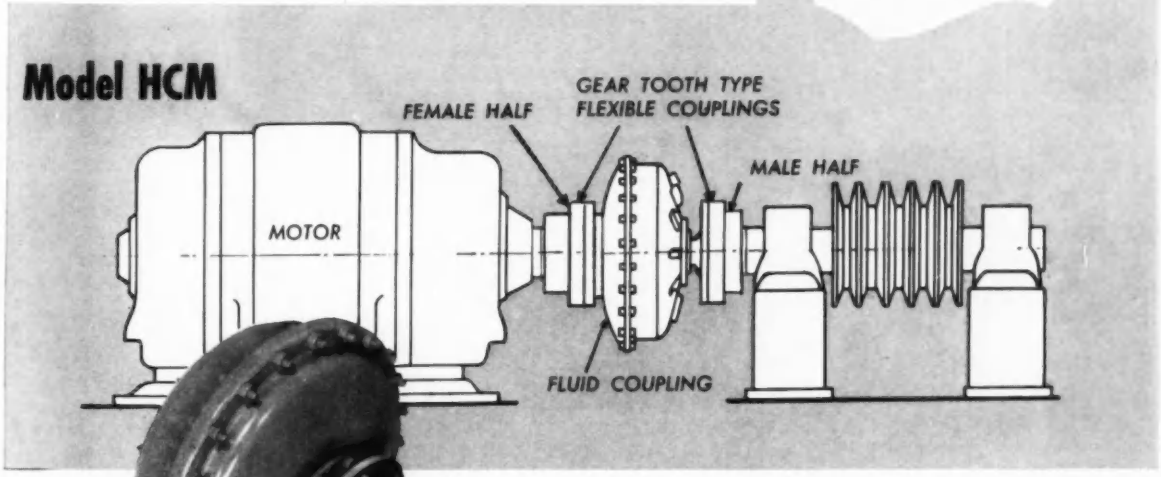
SYNTHETIC RESINS

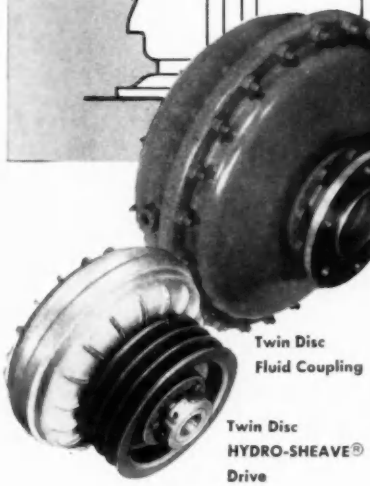
Division of BORG-WARNER • Washington, W. Va.

also represented by:
WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto
EXPORT: British Anchor Chemical Corp., New York

MEMO to drive line designers:

Twin Disc Fluid Couplings give you all the benefits of fluid drive *PLUS* easy installation . . .





Twin Disc Fluid Coupling

Twin Disc HYDRO-SHEAVE® Drive

Working between engine or motor and driven equipment, Twin Disc Fluid Couplings provide performance benefits aplenty . . . benefits such as satin-smooth power flow, protection against shock loads, full transmission of input torque, and elimination of engine lugging and motor burnouts.

Here's another big advantage that's sometimes overlooked: Twin Disc Fluid Couplings are exceptionally easy to apply and install. They come in a wide variety of input-output combinations to match any hook-up requirement. A good example is the Model HCM coupling shown above.

Model HCM features an input flange and a flanged output shaft that connect between two halves of a gear-tooth type flexible coupling. The result is an extremely compact arrangement with minimum distance between driving and driven shafts (see diagram). Model HCM is available in nine sizes from 7.4S to 21 with capacities from ¾ to 500 hp.

A special integrated power transmission package is Twin Disc's HYDRO-SHEAVE® Drive. This low-cost conversion device has a tapered hub that permits the use of a wide range of quick-detachable V-belt sheaves. It can be installed in less than five minutes. Available for motors and engines in the ¾ to 50 hp range, the HYDRO-SHEAVE comes filled with hydraulic fluid and ready to install.

In all, Twin Disc offers design engineers a choice of ten fluid coupling models including a disconnecting-type and a fluid power take-off.

Write our Rockford office for Bulletin 144-D.

TWIN DISC

TWIN DISC

Friction Clutches and Fluid Drives

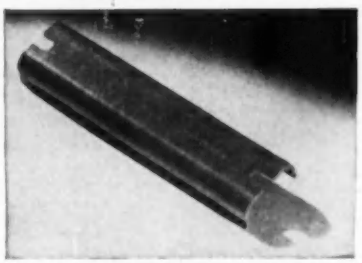
TWIN DISC CLUTCH COMPANY

Racine, Wisconsin

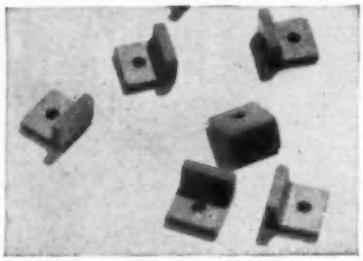
Hydraulic Division, Rockford, Illinois

Circle 215 on Inquiry Card, for more data

C D F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



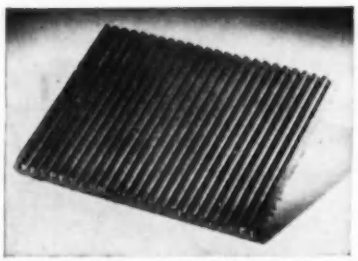
C D F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



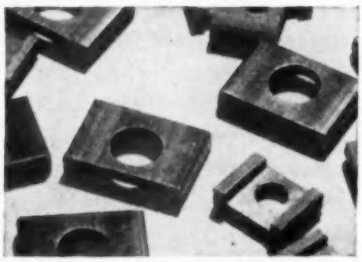
C D F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C D F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C D F is a big reliable source for fabricated plastics!



C D F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



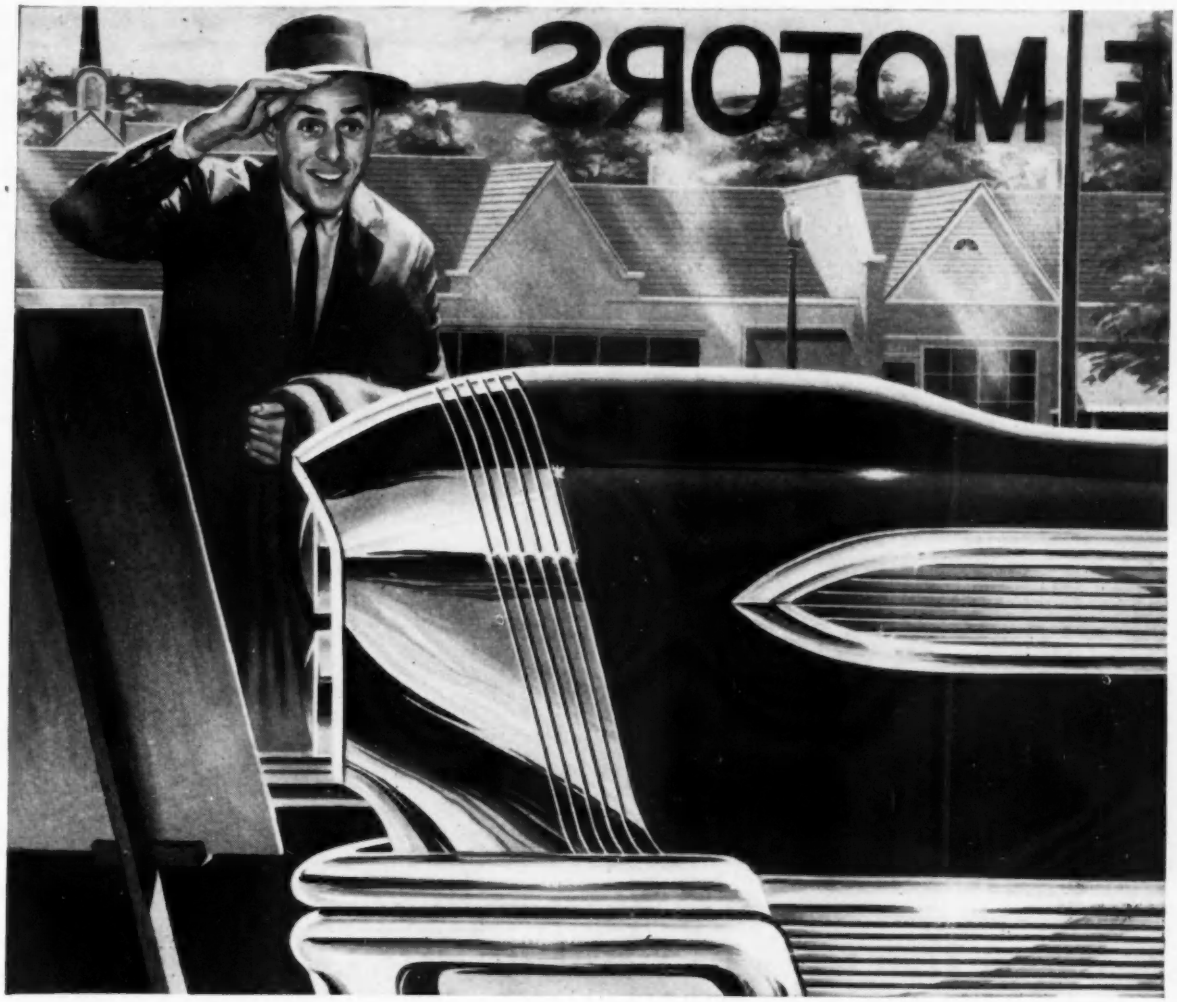
C D F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.

C D F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE Budd COMPANY • NEWARK 2, DEL.



Put the gleam in his eye...keep it there with quality Nickel-chrome plating

Quality Nickel-chrome plating – plating with a heavy, solid Nickel undercoat – can really snap-up a new car's appearance. And its beauty stays bright and gleaming for years and years.

That's because heavy Nickel plating does four important things for your cars' trim:

1. It makes a smooth, white-metal foundation for a brilliant finish.

2. It protects the basis metals from rust and corrosion.

3. It backs up the chrome and keeps it from cracking under impact.

4. It keeps the trim bright for long life.

And with Nickel now in plentiful supply, you can get all the Nickel you need for heavy Nickel plating. What's more, the chart to the right shows you that Nickel supplies will be abundant as far into the future as any man can foresee.

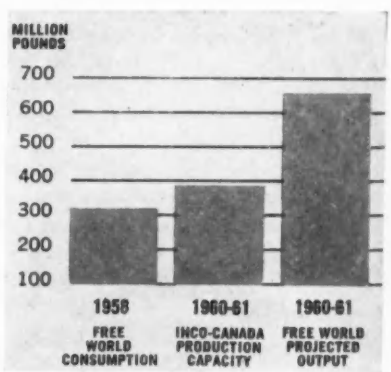
This means you can plan to take advantage of the lasting beauty of quality Nickel-chrome plating. Use this quality finish to put the gleam in your customer's eye . . . to keep it there . . . to keep him sold.

For more information on Nickel plating that can step up the quality of your new car chrome, write for our new booklet—*"Practical Answers to 40 Practical Questions About Nickel Plating"*.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

Inco Nickel

Makes metals perform better longer



Abundant Nickel supplies. In 1960-61, Inco's new Thompson mine in Manitoba will have an output potential of 75 million pounds—boosting Inco-Canada's capacity to 385 million pounds a year—this alone is more than total Free World consumption in 1958.

Circle 110 on Inquiry Card, for more data

Save the cost of tooling up! . . . Specify Spicer components in your new axle design

The easy, economical way to design even the most unusual new axle is to build it around one or more Spicer components...this stock differential assembly, for example.

So why not recheck your blueprints? 9 out of 10 times you'll find Spicer can deliver just the differential assembly you need for your latest front or rear driving axle . . . at a fraction of the cost of producing a new design.

What's more, samples can be obtained quickly for any new development program.

The easiest way is to contact your Dana representative. He'll be glad to match up any number of Spicer axle components to create . . . at the lowest possible cost . . . just the axle you have in mind.

Spicer also has a line of rear and front driving axles with load carrying capacities from 1000 to 7500 lbs.

Be sure to write for Bulletin No. 607. It gives you all the dimensions you need to start designing with Spicer differential assemblies.

DANA Spicer

DANA CORPORATION • **Toledo 1, Ohio**

DANA PRODUCTS Serve Many Fields:

AUTOMOTIVE: Transmissions, Universal Joints, Propeller Shafts, Axles, Powr-Lok Differentials, Torque Converters, Gear Boxes, Power Take-Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

INDUSTRIAL VEHICLES AND EQUIPMENT: Transmissions, Universal Joints, Propeller Shafts, Axles, Gear Boxes, Clutches, Forgings, Stampings.

AVIATION: Universal Joints, Propeller Shafts, Axles, Gears, Forgings, Stampings.

RAILROAD: Transmissions, Universal Joints, Propeller Shafts, Generator Drives, Rail Car Drives, Pressed Steel Parts, Traction Motor Drives, Forgings, Stampings.

AGRICULTURE: Universal Joints, Propeller Shafts, Axles, Power Take-Offs, Power Take-Off Joints, Clutches, Forgings, Stampings.

MARINE: Universal Joints, Propeller Shafts, Gear Boxes, Forgings, Stampings.

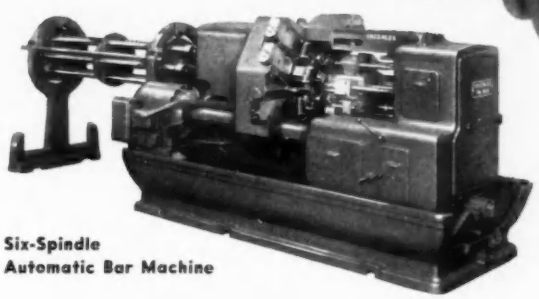
Many of these products manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario.

Circle 218 on Inquiry Card, for more data

GREENLEE MILLING ATTACHMENT

PRODUCTION MACHINERY

GREENLEE



Six-Spindle
Automatic Bar Machine

Mounts on Main Tool Slide

The Greenlee milling attachment eliminates second operation milling on many jobs. Two millers, normally mounted in 3rd and 4th positions, can profitably mill squares or double slot end of work piece at bar automatic speeds. The cutter head rotates at the same RPM as the work piece. Cutter speed is independent of spindle speeds. The Greenlee milling attachment is only one of many versatile standard and special attachments that expand your job range . . . increase your profits. Find out how Greenlee attachments can help you. Get the details from your Greenlee Distributor.

Write for your copy of Catalog A-405 — first step on the way to more profitable production with Greenlee Automatic Bar Machines.

OTHER GREENLEE ATTACHMENTS AVAILABLE

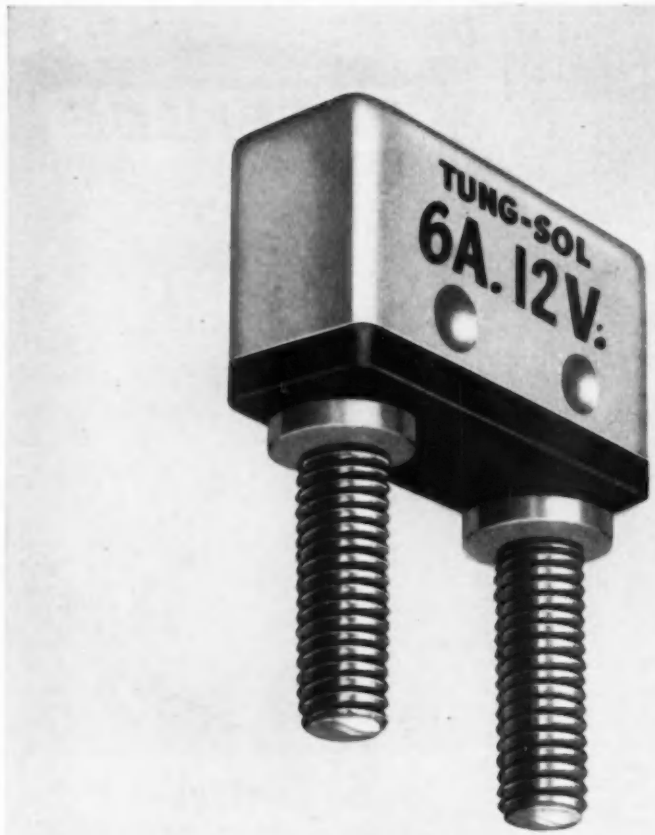
- Eccentric Boring
- Eccentric Drilling
- Eccentric Forming
- Eccentric Turning
- Crimping
- Gear-Fed Reaming
- Relieved Type Facing
- Thread Rolling
- Broaching
- Trepanning
- Hollow Milling
- Burring

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

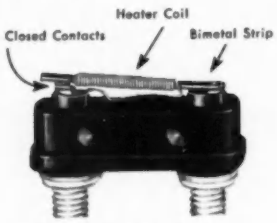
- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines
- Die Casting Machines

GREENLEE
BROS. & CO.

1754 MASON AVE.
ROCKFORD, ILL.

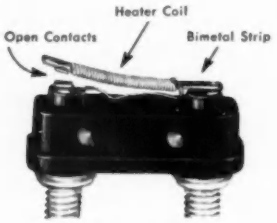


Method of Operation



NORMAL CONDITIONS

Current flows thru strip attached across breaker studs. When contacts are closed, heater coil is short circuited and has no heating effect.



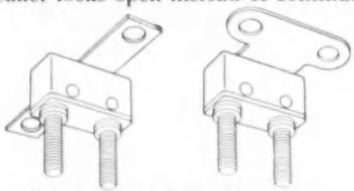
EMERGENCY CONDITIONS

A short circuit or overload increases current. Causes strip to bend away from contacts. When contacts part, heated coil holds contacts open.

REMOTE RESET

means positive circuit protection

Here's complete protection against burned out accessory motors and wiring, damaged breakers and run-down batteries. When the circuit is overloaded or shorted, the Tung-Sol 12-volt remote reset circuit breaker locks open instead of continuing to pulsate. When the cause of the overload or short is removed, the breaker is then remotely reset. It reactivates the circuit within 30 seconds.



TWO STANDARD MOUNTING BRACKETS

Available in 6, 10, 15, 20, 30 and 40 amp. ratings with a choice of two standard mounting brackets, Tung-Sol remote reset circuit breakers are used in a wide variety of automotive applications. For further information write Automotive Products Division, Tung-Sol Electric Inc., Newark 4, New Jersey.

TUNG-SOL®

REMOTE RESET CIRCUIT BREAKERS

Circle 220 on Inquiry Card, for more data

EVANS HEATERS ARE RIGHT FOR TRUCKS BECAUSE THEY'RE BUILT FOR TRUCKS!

There's as big a difference between truck and car heaters as there is between truck and car tires. The rugged construction of Evans truck-built heaters . . . the combination of the right BTU rating and *proper heat distribution* . . . just can't be matched by heaters built for cars. Whatever your truck heating requirements, our engineers are ready to work with yours to design an Evans heater to do the job. Write Evans Products Company, Dept. P-5, Plymouth, Mich.

Regional Representatives: Cleveland, Frank A. Chase; Chicago, R. A. Lennox; Detroit, Chas. F. Murray Sales Co.; Allentown, Pa., P. R. Weidner

EVANS

TRUCK AND BUS HEATERS AND VENTILATING SYSTEMS

•

EVANS PRODUCTS COMPANY

Plymouth, Michigan

EVANS

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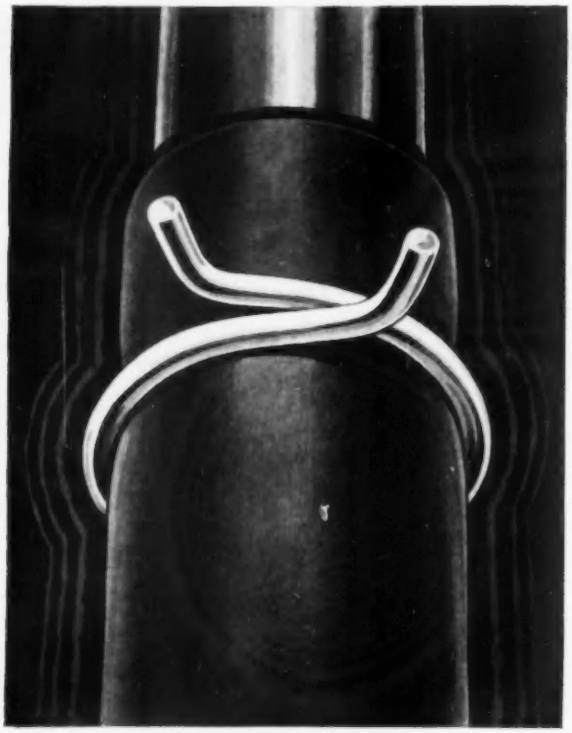

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CORBIN

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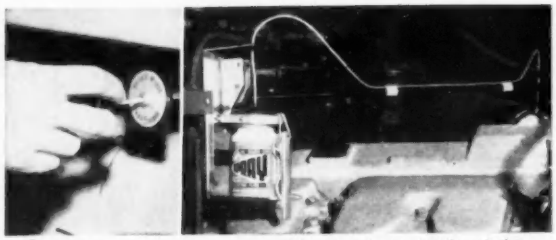

*Patent Pending ▲A cover, not shown, protects the mechanism.

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making Dies and Templates
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With DYKEM Steel Blue
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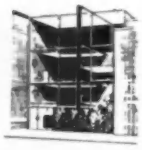
A CHILTON  PUBLICATION

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The crane illustrated is a typical double girder installation. For shorter spans, smaller capacities and lighter or intermittent duty Borg-Warner Industrial Cranes can supply your needs at even lower prices.

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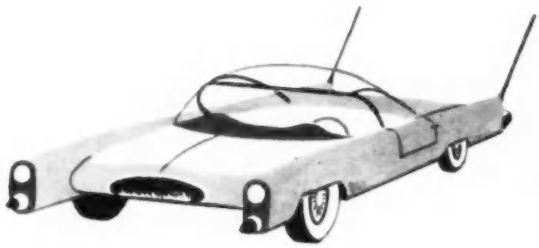

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FREE LITERATURE

Socket Screw Products 1

The Bristol Co. has released 32 page Catalog 765 which covers the company's line of socket screw products. Including specifications and design standards, the catalog lists hex socket set screws, hex socket cap screws, and others.

Punch Presses 2

Kenco Electro-Safe punch presses, designed for increased production of stampings, are described in a four page folder issued by *Kenco Mfg. Co.*

Facilities Brochure 3

Peterson Products Corp. has announced publication of a brochure which describes their facilities for producing deep drawn parts and metal stampings to customer specifications.

Tracing Attachment 4

Bulletin STM-1, six pages, features the Synchro-Trace, a fully automatic 3D programmed control system for milling applications. *True-Trace Sales Corp.*

Industrial Lubrication 5

A complete line of automatic, air-powered and hand operated lubrication equipment for industrial plants is illustrated in a 16 page catalog prepared by *Gray Co., Inc.*

Vibrating Screens 6

A large selection of vibrating screens, 12 different types in 212 sizes, is presented in "Vibrating Screens," a 48 page booklet (2777) which also contains information on screen cloth and accessories. *Link-Belt Co.*

Oil Selection 7

"Lubrication of Roller and Silent Chain Drives" covers principles of lubrication, maintenance, and oil selection. *Sun Oil Co., Industrial Products Dept.*

Surface Grinders 8

Catalog CGS-59 describes the full line of Landis precision surface grinders. Included are specifications and extra equipment. *Landis Tool Co.*

(Please turn page)

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FREE LITERATURE—*Continued*

Pump Catalog 9

Centrifugal and rotary pumps for a wide range of industrial uses are described and illustrated in a 72 page, two-color catalog issued by the *Paris Products Div. of Detroit Harvester Co.* The pumps described vary in size from a rating of 1/20 to 5 hp. They deliver from 1 pint to 148 gpm.

Copper Alloys 10

Full information on beryllium copper 10, 25, and 165 alloys for electronic, automotive, and other applications is given in a 12 page data sheet published by *Pennrold Div., The Brush Beryllium Co.* Chemical analysis, physical constants and mechanical properties of each alloy are given.

Heavy-Duty Barrels 11

Pangborn Corp. has published Bulletin 705 which describes the complete line of Pangborn heavy-duty Rotablast barrels. Design features and the capacities for each size of the five heavy-duty series are included.

Stainless Strip Steels 12

A book on martensitic stainless strip steels, those that can be hardened and tempered, has been printed by *Uddeholm Co. of America.* The booklet describes how these steels can be used in many applications previously restricted to straight high carbon strip steels.

Metal Cleaning 13

Oakite Room-Temp metal cleaner, designed primarily for use in spray washing machines, is covered in Folder F10596. The compound is used most frequently in the temperature range of 80 to 100 F. *Oakite Products, Inc.*

Tubing Data 14

The Monel family of small tubing is described in a four page technical bulletin. Listed are the chemical composition, physical constants, and mechanical properties of four materials in tubing form. *Superior Tube Co.*

Socket Cap Screws 15

Bulletin G-25, featuring a line of large diameter hex socket cap screws, has been issued by *The Allen Mfg. Co.*

Magnesium Alloys 16

"Magnesium Alloys Improve Aircraft Performance" describes the physical and mechanical properties of magnesium castings, sheet, and extrusions that are advantageous in airframe design and gives numerous case histories of magnesium applications in aircraft, missiles and helicopters. *The Dow Chemical Co.*

Vibration Control 17

Eight page booklet K4E gives engineering specifications and performance data for 27 types of products for the control and measurement of machinery vibration, shock, and noise. *The Korfund Co.*

Metal Heat Guard 18

A brochure, describing the Flame Ceramic Process of protecting metals against temperatures up to 5500 F, has been issued by *Continental Coatings Corp.*

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FREE LITERATURE—
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Mercury Switches 19

Catalog 90b describes the standard line of Honeywell mercury switches for use in simple interlock mechanisms to intricate space craft guidance systems. *Micro Switch, a Div. of Minneapolis-Honeywell Regulator Co.*

Filter Data 20

Brochure BFD-53, four pages, describes the research, engineering, production and quality control functions in the field of micronic filtration at *Bendix Filter Div. of Bendix Aviation.*

Electrical Connectors 21

A fully illustrated catalog describing the complete line of Joy electrical connectors for industry has been issued by the *Electrical Products Div. of Joy Mfg. Co.*

Displacement Gyro 22

Lear 1080 series ruggedized displacement gyros, designed for application in missiles and drones, as well as helicopters and high performance manned aircraft, are described and illustrated in a four page color folder prepared by *Lear, Grand Rapids Div.*

Swivel Casters 23

Form 1759, four pages, describes the 900 Series of medium-heavy duty swivel-plate casters which have load capacities of 175 to 700 lb each. A wide variety of wheel types are available in 3, 4, 5, 6, and 8 in. diameters. *Faultless Caster Corp.*

Crane Equipment 24

The complete line of P&H electrical and electronic equipment specifically designed and built for overhead cranes is fully described and illustrated in Bulletin C5-2. *Harnischfeger Corp.*

(Please turn page)

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Tracer Mills 25

A four page brochure entitled "Famco True Trace Hydraulic Tracer Mills" is available from *Famco Machine Co.* It describes in detail the variety of work that can be performed with Famco True Trace machine tools.

Multipresses 26

A revised and expanded version of its brochure on Multipresses and press accessories has been published by *Denison Engineering Div., American Brake Shoe Co.*

Separator Unit 27

A compact Magnaflow separator unit for the automatic removal of ferrous solids from cutting oils and other soluble coolants is described in a brochure issued by the *U. S. Hoffman Machinery Co.*

Timing Belt Drive 28

The "Time-Tex" timing belt drive constructed with steel cable cords imbedded in neoprene fully molded with nylon base fabric is covered in Bulletin 20B8760. *Allis-Chalmers Corp.*

Clamp Starter Set 29

Brochure 858 graphically illustrates all the components of the Hi-Lo clamp starter set and shows how adjustable Hi-Lo clamps are used to secure workpieces on bolster plates and machine tool tables. *Hi-Lo Products Co.*

Precision Components 30

PIC Design Corp. is offering 416 page master Catalog #20. The catalog lists over 10,000 items, including gears, shafts, collars, couplings, speed reducers, differentials and other precision items.

AUTOMOTIVE INDUSTRIES . . .
is your News Magazine of Automotive and Aviation
MANUFACTURING

CLEAR-O-MATIC*

THE "CONTROLLED EXPANSION" PISTON

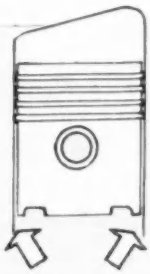
Engineered for COOLER RUNNING

20% Greater Heat Conductivity

GREATER DURABILITY

No Compromise with Strength in Design

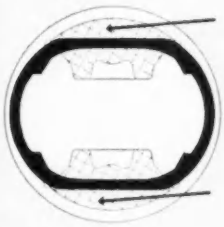
Superiority is outstanding in the Zollner "Clear-O-Matic" Piston. The expertly engineered design of this great piston development incorporates vitally desired performance advantages in addition to the basic Zollner designed expansion control feature. Clear-O-Matic is a remarkably cool piston with greater area of conductivity for heat dissipation. This greater section provides uncompromised strength for long-life durability. No other piston provides Clear-O-Matic advantages. We suggest an immediate test for your engine.



STEEL TENSION MEMBER

Anchored only at pin bosses and cast in positive contact with I.D. of piston skirt.

Automatically maintains uniform effective skirt clearance at all temperatures.

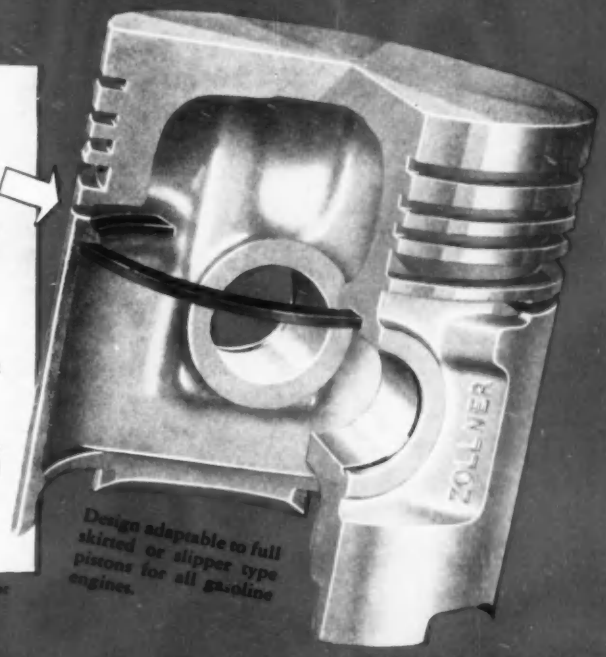


COOL PISTONS

20% greater section for heat conductivity.

DURABILITY

Greater section above pin bosses provides uncompromised strength with long life.



Design adaptable to full skirted or slipper type pistons for all gasoline engines.

*T.M. Reg. Pat. Apply. For

Advanced Engineering

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THE ORIGINAL EQUIPMENT PISTONS

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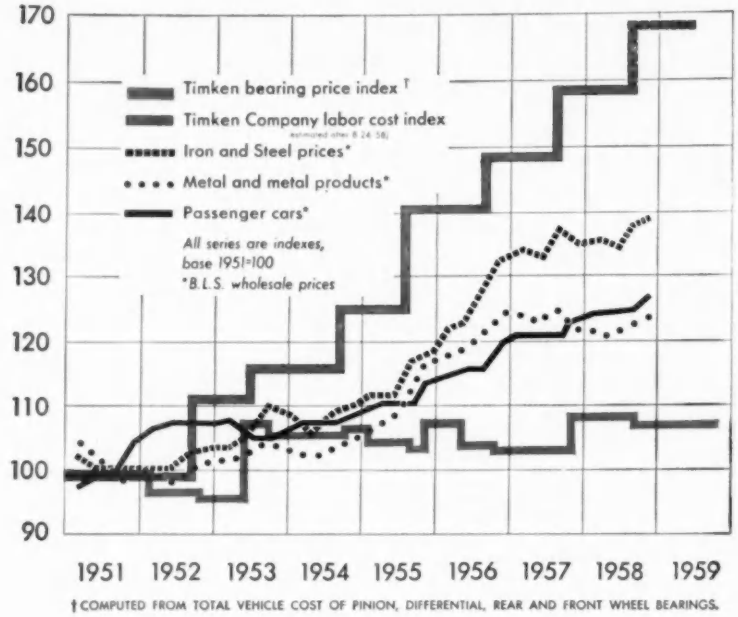
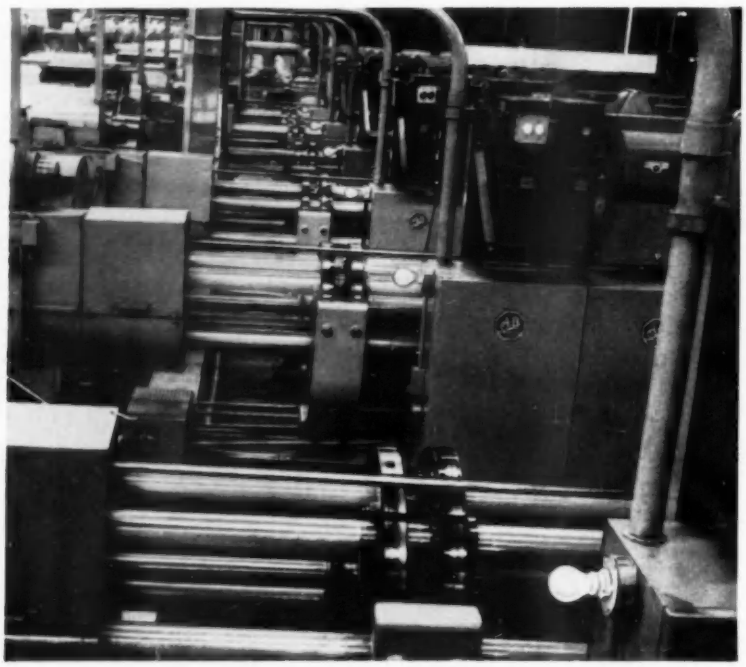


† COMPUTED FROM TOTAL VEHICLE COST OF PINION, DIFFERENTIAL, REAR AND FRONT WHEEL BEARINGS.

You can beat inflation with standardization



YOU almost need a ladder to chart most of your costs, they're going up so fast. But one cost isn't. Timken® tapered roller bearings for passenger cars are staying down low as a new-car silhouette. And that's beating inflation with standardization.

By standardizing on fewer bearing sizes you've kept our new ultra-modern bearing plant in Bucyrus, Ohio (at left) turning out millions of better bearings at lower cost. They're high-speed production "green light" bearings—smaller, lighter, capacity-packed, able to cut costs in related parts, too. Want to create still more savings? Then look for new applications for Timken "green light" bearings (our engineers will help you). And buy more *Timken* bearings made in our cost-cutting plant. The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

TIMKEN® TAPERED ROLLER BEARINGS

First in bearing value for 60 years

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